

ISBN : 978-93-5980-767-6

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**ENTREPRENEURSHIP AND INDUSTRIALIZATION FOR RURAL
RECONSTRUCTION AND DEVELOPMENT**



ISBN : 978-93-5980-767-6

(Volume - 01)

Date : July 10, 2023

Entrepreneurship and Industrialization for Rural Reconstruction and Development

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PUBLISHERS

Uddeshya Publication

Prayagraj [Uttar Pradesh]

E - mail : uddehsyapublications@gmail.com

E-Book Publishing Date : July 10, 2023

Hardbound Print : August 15, 2023

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Entrepreneurship and Industrialization for Rural Reconstruction and Development

PART – FIRST (I)

THIS BOOK IS DEDICATED TO THE MEMORY OF MY GRAND MOTHER

LATE SMT SARASWATI DEVI W/O LATE SHRI VISHRAM SINGH

WHO IS NO LONGER ALIVE TO REALIZE

HOW HIS ELDEST GRANDSON IS MAKING HER PROUD

.....Prof Jitendra Singh Bhadauria

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CHAPTER - 01

WATER RESOURCES FOR RURAL INDUSTRIALIZATION AND RECONSTRUCTION

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1.1 INTRODUCTION

Each and every Industry and its business decisions are directly or indirectly linked with local or regional natural resources. Though natural changes have changed the earth's climate several times in thousands of years, but in current era the changes have been accelerated due to increased global warming and which is directly attributed by human activity—specifically due to burning of fossil fuels and waste collections. Water plays an important role in ensuring equitable, sustainable and productive rural economies. It is an essential element for agricultural production, nutrition and human health, and highly influences rural economy. Climate-related impacts on water resources are increased.

The global warming is affecting water and energy resources, and the challenges and opportunities this presents globally. Evidence of increased severe weather events, flooding, and reducing ice cover at higher altitudes, can all be attributed to climate change. Numerous scientific studies show high temporal and spatial variability in rainfall amount and duration, change in rainfall intensity and spatial extent of droughts, increased temperatures, and warmer sea surface temperatures, and reducing glaciers and snow are adversely affecting the water resource management throughout the world. The world is now warming faster than at any point in recorded history. Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature.

Global temperature has shown arising trend since the early 20th century this has become more visible since the late 1970s. The average surface temperature has shown a rise of about 1°C globally since 1880, relative to the mid-20th century baseline (of 1951-1980). 2011-2020 was the warmest decade recorded, with global average temperature reaching

1.1°C above pre-industrial levels in 2019. Human-induced global warming is presently increasing at a rate of 0.2°C per decade. An increase of 2°C at many regions have caused serious negative impacts on to the natural environment and human health and created higher risk of alarming and catastrophic changes in the global environment. Greenhouse effect is the main driver of climate changes.

India is one of the countries most affected by climate change and occupies sixth place in the Global Climate Risk Index 2018. According to India's Composite Water Management Index (2018), 600 million people in the country are suffering from an acute shortage of water. A shrinking and sometimes contaminated water supply, heavy reliance on rainfall and a lack of alternative irrigation systems are a major problem in rural areas, where some 70 per cent of the Indian populations live. In this changing climate scenario water security and water resource conservation is of prime concern.

The increased water shortages and unwanted floods have created investment issues for water infrastructure, water supply management, water governance and shortages of water related skills in water resource governance and management and chances of innovative jobs based on technical skills. Various projects have been launched MoRD and NWM together, to improve India's water security by taking climate change into account, to strengthen the knowledge and capacity of public and private institutions, as well as of stakeholders and to implement integrated water resource management.

1.2 WATER AND SUSTAINABLE DEVELOPMENT GOALS

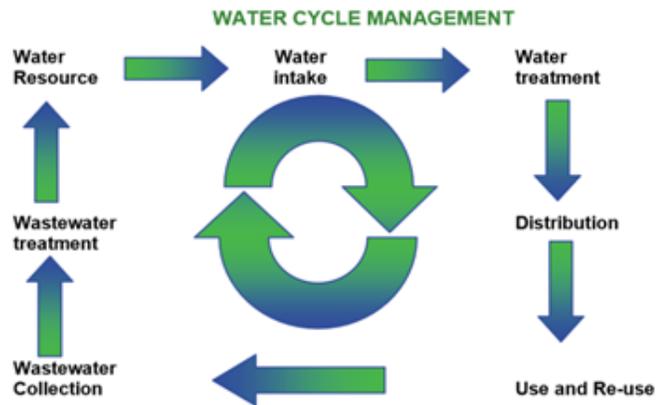
Sustainable management of water resources and access to safe water and sanitation are essential for unlocking economic growth and productivity, and provide significant leverage for existing investments in health and education. The natural environment e.g. forests, soils and wetlands contributes to management and regulation of water availability and water quality, strengthening the resilience of watersheds and complementing investments in physical infrastructure and institutional and regulatory arrangements for water access, use and disaster preparedness.

Water shortages undercut food security and the incomes of rural farmers while improving water management makes national economies, the agriculture and food sectors more resilient to rainfall variability and able to fulfil the needs of growing population. Protecting and restoring water-related ecosystems and their biodiversity can ensure water purification and water quality standards.

Table.1.1 Sustainable Development Goals leading to make water affordable to all

SDG 6	
<i>SDG 6.1 : SAFE AND AFFORDABLE DRINKING WATER</i>	By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
<i>SDG 6.2 : END OPEN DEFECATION AND PROVIDE ACCESS TO SANITATION AND HYGIENE</i>	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
<i>SDG 6.3 : IMPROVE WATER QUALITY, WASTEWATER TREATMENT AND SAFE REUSE</i>	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
<i>SDG 6.4 : INCREASE WATER-USE EFFICIENCY AND ENSURE FRESHWATER SUPPLIES</i>	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
<i>SDG6.5 : IMPLEMENT INTEGRATED WATER RESOURCES MANAGEMENT</i>	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
<i>SDG 6.6 : PROTECT AND RESTORE WATER-RELATED ECOSYSTEMS</i>	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
<i>SDG 6.7 : EXPAND WATER AND SANITATION SUPPORT TO DEVELOPING COUNTRIES</i>	By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.
<i>SDG 6.8 : SUPPORT LOCAL ENGAGEMENT IN WATER AND SANITATION MANAGEMENT</i>	Support and strengthen the participation of local communities in improving water and sanitation management.

A goal of the United Nations (UN) Millennium Declaration was to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. Although the target for drinking water was reached but sanitation target could not be achieved. Even in cities with sewerage systems, only a small proportion of the wastewater within the system is collected and the remainder is discharged to open drains or disposed of locally. More attention has been given to the supply of affordable clean water than sanitation. Once clean water is available, only then are communities interested in the provision of latrines and improved sanitation facilities. Access to clean and reliable water is a fundamental human right, essential for personal hygiene, agriculture, and industrial processes. While urban areas often enjoy advanced water infrastructure and industrialization, rural regions frequently face challenges in this regard. Rural water industrialization is a crucial initiative aimed at enhancing the economic and social well-being of rural communities by providing them with the resources and infrastructure necessary for industrial growth.



1.3 RURAL WATER QUALITY MANAGEMENT

Rural water quality management is a critical component of ensuring access to safe and clean drinking water in rural areas. The quality of water in rural areas is often influenced by various factors, including agricultural runoff, natural contaminants, and inadequate infrastructure. Effective water quality management in rural areas is essential for promoting health, preventing waterborne diseases, and supporting the well-being of local communities.

1.3.1 CHALLENGES TO RURAL WATER QUALITY

- **Contaminant Sources** : Rural water sources may be vulnerable to contamination from agricultural runoff, industrial discharges, and naturally occurring substances like heavy metals and microorganisms.
- **Limited Infrastructure** : Rural areas often lack the robust infrastructure required for treating and distributing clean water, making it challenging to maintain water quality.

- **Health Risks** : Poor water quality can lead to waterborne diseases, including cholera, dysentery, and typhoid, which disproportionately affect rural communities.
- **Agricultural Impact** : Agricultural activities can contribute to water pollution through the use of pesticides and fertilizers. Managing this impact is crucial for both water quality and agricultural sustainability.

1.3.2 STRATEGIES FOR RURAL WATER QUALITY MANAGEMENT

- **Water Source Protection**: Identify and protect clean water sources from potential contamination. Establish buffer zones and implement land-use practices that minimize the risk of pollution.
- **Infrastructure Development**: Invest in the construction and maintenance of water treatment facilities, distribution networks, and sanitation systems to ensure the provision of safe water to rural communities.
- **Monitoring and Testing**: Regularly monitor and test the quality of rural water sources to identify potential contaminants and take corrective actions promptly.
- **Community Education**: Educate rural communities about the importance of water quality, hygiene practices, and the consequences of water contamination. Promote behavior change through awareness campaigns.
- **Agricultural Best Practices**: Encourage sustainable agricultural practices that minimize the use of harmful chemicals and promote soil conservation to prevent runoff.
- **Capacity Building**: Provide training and capacity-building programs to local authorities and community members to ensure effective water quality management.
- **Collaboration**: Foster partnerships between government agencies, non-governmental organizations, and local communities to implement comprehensive water quality management plans.

1.4 RURAL INDUSTRIALIZATION

The rural industrialization includes making it easier for people to find jobs in non-farm activities near to their place. It should have positive role in increasing the production of consumer products and wages items, which can be created through village industries or small scale industries by using variety of resources. Application of advance technologies in indigenous form may be its ability to attract potential customers. Rural industrialization is a development approach that must obviously emphasises employment, which implies a larger

focus on small-scale activities. These generally provide the rural poor with more work and income opportunities. Rural industrialization is the term for non-agricultural economic activities that take place in communities and range in size from families to small industries. Water resources are natural resource are used in variety of in farm and non-farm activities and services it allows people to improve their living standards and reduce their level of poverty. Rural industrialization should have the primary goal of accelerating rural development in addition to benefiting individuals.

Role of water resources in rural industrialization has been increasing with the technology advancement and the opportunities in water supply, treatment, management and providing adequate access. Water can support productivity and food security, improve public health, and contribute to economic growth and poverty reduction in rural areas

1.5 RURAL WATER INDUSTRIALIZATION

Rural water industrialization is a transformative process that brings about economic and social development in rural areas by leveraging the potential of water resources. Water is a fundamental element for life and prosperity, Access to clean and reliable water is a fundamental human right, essential for personal hygiene, agriculture, and industrial processes. While urban areas often enjoy advanced water infrastructure and industrialization, rural regions frequently face challenges in this regard. Rural water industrialization is a crucial initiative aimed at enhancing the economic and social well-being of rural communities by providing them with the resources and infrastructure necessary for industrial growth.

The Importance of Rural Water Industrialization

- **Economic Growth** : Rural water industrialization enables the establishment of various industries that rely on water resources, such as agriculture, food processing, and microenterprises. By diversifying the local economy, it reduces dependence on agriculture alone and opens up new income-generating opportunities for rural populations. Rural water industrialization plays a pivotal role in catalyzing economic development in rural areas.

By providing access to clean water for agricultural, manufacturing, and processing activities, it creates opportunities for job creation and income generation. This, in turn, reduces rural-to-urban migration as people can find employment within their communities. Activities like irrigation, aquaculture, and small-scale manufacturing units

can provide jobs for both skilled and unskilled labor, reducing unemployment and poverty in rural areas.

- **Agriculture** : Agriculture forms the backbone of many rural economies. Access to water for irrigation, livestock, and crop cultivation is essential for improving agricultural productivity. Rural water industrialization supports modern farming techniques, ensuring a stable food supply and income for rural farmers. Access to water resources allows for the expansion of agricultural practices. Irrigation systems can significantly increase crop yields, ensuring food security and surplus for sale. This, in turn, stabilizes the income of rural farming communities.
- **Access to Basic Services** : Rural water industrialization improves access to essential services like healthcare, education, and sanitation. Clean water sources can be used for drinking, and sanitation facilities can be developed to promote better hygiene, reducing waterborne diseases and improving overall well-being.
- **Food Processing** : Rural areas often have an abundance of agricultural resources. Water industrialization allows for the development of food processing industries, helping to reduce food waste and increase the value of agricultural products, which can be sold in local and regional markets.
- **Micro and Small Enterprises** : Access to water enables the growth of micro and small enterprises, ranging from small-scale manufacturing to craft industries. These businesses can stimulate economic growth and provide livelihoods for rural populations.
- **Improved Healthcare** : Reliable access to clean water is essential for good health. Rural water industrialization projects often include the construction of water treatment facilities, reducing the incidence of waterborne diseases and improving overall health and well-being.
- **Infrastructure Development** : The need for efficient water supply systems and distribution networks promotes infrastructure development in rural areas. This includes the construction of roads, bridges, and storage facilities, which not only facilitate water management but also enhance connectivity and accessibility to markets.

1.5.1 CHALLENGES IN RURAL WATER INDUSTRIALIZATION

- **Infrastructure Investment and Development** : The Establishing and creation of water infrastructure in rural areas can be a logistical and financial challenge and significant investment. Building and maintaining pipelines, reservoirs, and treatment facilities

require significant investments. Governments, non-governmental organizations, and private sector partnerships can play a crucial role in funding and managing these projects.

- **Technical Expertise** : Rural communities may lack the technical knowledge and skills needed for managing water infrastructure efficiently. Capacity building and training are essential components of successful industrialization initiatives.
- **Environmental Impact**: Industrialization in rural areas can have environmental consequences. Sustainable practices and environmental safeguards must be implemented to mitigate negative impacts on the environment.
- **Financing**: Securing funding for rural water industrialization projects can be a hurdle. Governments, international organizations, and private investors need to collaborate to ensure that adequate resources are available.
- **Technological Advancements**: Rural water industrialization can benefit from innovative technologies like solar-powered water pumps, efficient irrigation systems, and water purification methods to make the process more cost-effective and environmentally friendly.

1.6 WATER RESOURCE RECONSTRUCTION

Water resource reconstruction is a multifaceted approach aimed at revitalizing and improving water management systems to meet the evolving needs of communities, industries, and the environment. This process involves the assessment, renovation, and enhancement of water infrastructure and management strategies to ensure sustainable access to clean water, prevent water scarcity, and address environmental concerns. Water resource reconstruction is essential in the face of growing challenges like population growth, climate change, and increased demands on water resources.

1.6.1 THE NEED FOR WATER RESOURCE RECONSTRUCTION

- **Population Growth** : As the global population continues to expand, the demand for water resources intensifies, putting stress on existing water infrastructure.
- **Climate Change** : Altered precipitation patterns, increased droughts, and more severe weather events make it necessary to adapt and reinforce water management systems to ensure resilience.

- **Infrastructure Aging** : Many water supply and distribution systems in both urban and rural areas are aging, leading to inefficiencies, leaks, and losses.
- **Environmental Concerns** : Protecting water sources and ecosystems is a growing concern. The degradation of water bodies, soil erosion, and contamination necessitate improved water management.
- **Sustainable Development** : Water is a fundamental component of sustainable development. Ensuring its availability and quality is vital for economic growth, public health, and environmental conservation.

1.6.2 KEY COMPONENTS OF WATER RESOURCE RECONSTRUCTION

- **Infrastructure Upgrade**: Identifying and modernizing outdated or dilapidated infrastructure, including pipelines, reservoirs, treatment plants, and distribution systems, to enhance efficiency and reduce water loss.
- **Integrated Water Resource Management (IWRM)**: Implementing IWRM principles, which involve a holistic approach to water resources, taking into account various water uses, conservation, and ecological protection.
- **Technological Advancements**: Incorporating new technologies such as sensors, data analytics, and remote monitoring to improve the efficiency of water management systems.
- **Climate Resilience**: Adapting water management systems to climate change through strategies like flood control, drought preparedness, and water recycling.
- **Community Engagement**: Involving local communities and stakeholders in the decision-making process to ensure water resource reconstruction aligns with their needs and values.

1.6.3 CHALLENGES AND SOLUTIONS

- A) Funding**: Water resource reconstruction requires substantial investments. Public-private partnerships, international funding, and innovative financing models can help bridge financial gaps.
- B) Technological Adoption**: The adoption of new technologies may face resistance or lack of expertise. Training and education programs can address these challenges.

C) Regulatory Frameworks: Developing and enforcing regulations that promote sustainable water management and infrastructure development is essential.

D) Ecosystem Conservation: Balancing the needs of human populations with the protection of ecosystems can be complex. Sustainable practices and conservation measures should be integrated into reconstruction efforts.

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1.8 CONCLUSION

Rural water resources are the lifeblood of rural communities, supporting their health, agriculture, and industries. Sustainable management is crucial for rural development, and addressing the challenges of water scarcity, pollution, and climate change is essential. By adopting integrated approaches, involving local communities, and implementing conservation measures, rural water resources can continue to be a source of prosperity and well-being for rural populations while preserving the environment. Rural water industrialization is not merely about providing access to water; it is about empowering rural communities, enhancing their economic prospects, and improving their overall quality of life. This holistic approach to development can bridge the urban-rural divide, reduce poverty, and

contribute to sustainable, long-term growth. By addressing the challenges associated with this process and fostering collaboration among governments, organizations, and local communities, rural water industrialization can become a powerful driver of positive change in rural areas worldwide.

It is essential to ensure that rural communities have access to clean and safe water, supporting their well-being and promoting economic development. By addressing the challenges, implementing effective management strategies, and fostering community involvement, rural water quality can be maintained at high standards, benefiting both people and the environment. The development of a wastewater system in rural industrialization supports economic growth, protects the environment, and promotes public health. With the right investments, technologies, and community engagement, rural areas can establish wastewater systems that contribute to the overall well-being of their communities while fostering sustainable industrialization. Water resource reconstruction is a dynamic and adaptable process that responds to the evolving challenges of the 21st century. It is essential for ensuring that communities have reliable access to clean water, industries can operate efficiently, and ecosystems are protected. By addressing the challenges, embracing new technologies, and involving local communities, water resource reconstruction can foster sustainable water management and secure the future of this invaluable resource.

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CHAPTER – 02

EMPOWERING COMMUNITIES THROUGH ICT IN RURAL DEVELOPMENT

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2.1 INTRODUCTION

India is a nation of villages, and the socioeconomic changes in these areas will always be used as a gauge of progress. Generally speaking, rural development refers to the development of rural areas. The concept's scope includes people's and places' prosperity in rural areas. When discussing rural development, the goal must be to improve rural communities' overall quality of life rather than only focusing on the growth of a single industry. Rather, rural development refers to the all-encompassing, healthful development of rural areas. The year 1991 marked the start of a new era that brought significant changes to the nation's economic landscape. The Indian economy is open to international trade, substantial inflows of foreign capital, joint ventures, and technological advancements. The Indian economy's 92 e-government sectors are currently adapting to the shifting economic landscape. This also applies to the rural sector. ICT is a recent development in globalisation that has a significant effect on the rural sector. Increasing efficacy, responsiveness, and transparency as well as citizen involvement in the formulation and implementation of rural development initiatives are the primary objectives of ICT in rural development. It influences changes in rural lifestyle that are both qualitative and quantitative.

To develop rural and urban areas, governments and non-governmental organisations (NGOs) employ information and communication technology (ICT). One of the technology areas in the global civilization that is developing quickly is ICT. These days, rural policy is at the centre of policy discussions in many nations across the globe in order to effectively address and support the unique opportunities and needs that rural areas and its inhabitants face in the modern day. The over-exploitation of natural resources, sustainable employment in agriculture, related sectors like quality education, marketing infrastructure, and inadequate access to energy, transportation, communication, health care, food, and storage facilities are just a few of the issues that rural parts of India continue to face. The goal of the rural ICT applications is to give locals access to village-level services. Information and communications technology (ICT) has advanced to the point where users individuals, groups, corporations, organisations or governments can now communicate more quickly and effectively and store,

retrieve, process, exchange, and use data more efficiently. ICTs provide rural communities with the chance to implement new programmes, services, and applications or enhance already-existing ones. ICTs can also be used as advocacy and awareness tools to provide rural residents a voice in national politics. It influences changes in rural lifestyle that are both qualitative and quantitative.

Nonetheless, the advantages of ICT in rural regions have not yet materialised, and the poor and other rural residents in particular continue to have the least amount of ICT infrastructure. Apart from this, the main cause is the inappropriate ICT structure in rural areas. The fusion of humanitarian programmes and ICT has given rise to the newest catchphrase, "New India," or "Digital India." ICT is a convergence of various electronic technologies that provide information processing and communication tasks, including transmission and presentation. It is not limited to things like computers, the internet, or telephones. These days, the majority of gadgets, including slide projectors, mobile phones, digital cameras, and PDAs, can be connected to share and exchange information with others. These days, all of these gadgets are included in the ICT category. It is a known fact that the secret to successful development is having access to knowledge. Any country's socioeconomic development is directly correlated with improved access to information and communications.

▪ **SCOPE OF ICTS IN RURAL DEVELOPMENT**

If we make sure that communication is done in local languages that rural people can easily understand, we can stimulate and develop learning and skills in rural people. ICTs have a broad range of applications and the potential to be extremely important for both society and rural development.

2.2 THE ROLE OF ICT IN RURAL DEVELOPMENT

The idea of development is associated with rural development in developing nations such as India. The majority of Asian nations rely heavily on their rural areas. In order to support the rural areas' economic and social development, the governments of those nations focused on developing or improving them. ICT is essential to the development of rural areas. Advancements in Information and Communication Technologies have presented numerous prospects for rural communities. ICTs can help spread knowledge by easing the sharing of information about rural development. Policymakers who create strategies for rural development may get this information easily and utilise it. The majority of current ICT

initiatives concentrate on building infrastructure and expanding information and communication services from the core to the periphery.

▪ **APPLICATION OF ICT IN VARIOUS SECTORS**

In the modern world, information and communication technology is crucial. ICT can bridge the technological and economic divide between the more advanced and less advanced groups if it is applied properly. Government equipment may now easily access technology in a more convenient and cost-effective way thanks to India's IT growth. A revolution in rural development may undoubtedly be brought about via proper training and the implementation of ICT programmes in a language that is easily understood by the people living in rural areas.

▪ **APPLICATION OF ICT IN AGRICULTURE**

The majority of the impoverished are found in rural areas, where they either directly or indirectly make their living from agriculture. Information technology is playing an increasingly prominent role in the agriculture industry. One area where ICT might be beneficial is in helping small farms become more productive, efficient, and sustainable. Risks and uncertainties are inherent in farming, as farmers deal with numerous hazards such as poor soils, droughts, erosion, and pests. Important agricultural information like crop management, livestock, pesticides, fertilisers and raw materials, seed buying, and market value can be sent to farmers using ICT. It backs up innovative approaches to precision farming, such as computerised farm equipment for pesticide and fertiliser applications. Electronic equipment and tracking systems are utilised to monitor and provide food to farm animals.

Online purchasing and selling started to gain popularity worldwide. Applications based on ICTs can also make electronic trade easier by facilitating information about where, when, and how to buy and sell goods. ICTs can facilitate the transfer of lab-based research to the field. The most alluring ones for developing smart farmers are FM, community radio, cell phones, ground equipment, and measuring equipment. Touch screen kiosks, online farm clinics, social media, mass/reach media, Kisan call centres, TV channels, and other ICT-based platforms can all provide farmers with valuable information about crop maintenance and animal husbandry, fertiliser and feedstock, irrigation, drought mitigation, pest control, weather forecasting, seed sources, and market prices. In India, 65 percent of the people live in rural areas. According to the Economic Centre of India's (CMIE) Consumer Pyramid Data Household Survey, the percentage of employment in the agricultural sector grew from 35.3% in 2017–18 to 36.1% in 2018–19 and 38% in 2019–20. The Centre is committed to

collaborating to execute targeted programmes and technological developments in the field of agriculture.

▪ **E-NAM (NATIONAL AGRICULTURE MARKET)**

The Indian government introduced e-NAM, an online platform for farmers, in April 2016. It unifies agricultural markets throughout the country around the concept of "one nation, one market." Farmers can compete for the best price in the market by using the platform to view all "APMC" related information, product arrivals, and trades. Promoting commodity market integration and removing information asymmetry between buyers and sellers are the objectives. There are already 1.28 million traders using the site, and there are 1.66 million registered farmers. Additionally, over a thousand Farmer Producer Organisations (FPOs) have registered on this portal.

States	Number of e-NAM Platforms
Rajasthan	144
Uttar Pradesh	125
Gujarat	122
Maharashtra	118
Haryana	81

In agriculture, there are five main ICT-related services or activities:

- Information from several Agricultural Information Systems (AIS) kinds is accessible;
- Tracking the state of natural resources and their effects on the environment using various data (e.g., analysis of deforestation, soil erosion, and environmental degradation);
- Education and communication technologies, which are crucial in creating novel methods for knowledge management and learning;
- Through collaboration, ICT may help institutions and individuals connect with one another and build "virtual communities of stakeholders" where knowledge can be created and shared about one another. Networking is a first step towards creating interactive knowledge building processes that could result in learning networks if it is handled properly; and
- Decision Support Systems (DSS) use data and information to deliver pertinent information for decision-making. When it comes to converting data into information processes, these technologies are crucial. These ICT applications' primary goal, seen

through the lens of development, is to provide people with knowledge that empowers them.

2.3 NATIONAL INSTITUTE OF AGRICULTURAL EXTENSION MANAGEMENT

Over half of Indians still work in agriculture and live in rural areas as their primary source of income. Several initiatives are being undertaken to use ICT to enhance the social and economic circumstances of this class. Over the nation, the National Institute of Agricultural Extension Management has managed a number of "support network" initiatives. Websites at the district level are hosted, information kiosks are set up at the village, block, and Mandal levels, and other need-based and technical data is gathered, digitised, and uploaded to the internet. Through its webpages, the Institute has taken the effort to link to technical and other information that is relevant to farmers. Important information about district profiles, land use patterns, district agriculture scenarios, extension plans, strategic research, replicable success stories, and contact details of key individuals in the district, including phone numbers and email addresses, can be found on the websites of 24 districts in Andhra Pradesh. The distribution of information has been improved thanks to these websites.

2.4 APPLICATION OF ICT IN HEALTH

Health care is one of the most promising areas for poverty alleviation. ICTs can contribute to improving the coverage of national health services in rural areas. Healthcare is important for

- The general state of physical, social, and mental health
- Prevention of disease
- Detection and treatment of illnesses
- Quality of life
- Preventable death
- Life expectancy

Via its webpages, the Institute has taken the initiative to link to technical and other farmer-friendly information. The websites of 24 districts in Andhra Pradesh have vital information on district profiles, land use patterns, district agriculture scenarios, plans for strategic research and extension, replicable success stories, and contact details of key individuals, including phone numbers and email addresses. The way that information is distributed has greatly improved thanks to these websites.

- Financial resources for paying for services, such as health insurance that the provider accepts.
- It means accessing and using services such as transportation to services that may be far away and spending paid leave periods to use these services.

- Confidence in their capacity to interact with healthcare professionals, especially if they don't speak English well or have inadequate health literacy.
- Confidence in their ability to use services without compromising privacy.
- Trust the quality of care they will receive.

2.5 APPLICATION OF ICT IN EDUCATION

Using ICT to advance traditional education and bring about significant improvements is a terrific idea. The goals of ICT use in education are to democratise access to education and enhance the calibre of teaching and learning. Due to their extremely low marginal costs, the economics of producing digital media and using digital services permit large scale up. If access to IT resources can be obtained without incurring the relatively high fixed expenses associated with the development of relevant educational materials which can include substantial fixed costs then it is also economically feasible to generate educational materials in nations like India.

These instructional programmes can be economically provided by rural ICT providers as part of a larger package of services. These days, multimedia presentations and animations are the most popular types of e-content that draw in pupils. Regardless of their location or financial situation, rural residents may now access the best educational resources thanks to the introduction of online courses and the availability of e-study materials on the majority of education boards and institutions.

Furthermore, critical teaching, content integration, and information literacy (the ability to find, evaluate, and use information) can all be facilitated by the proper use of ICT in the classroom. As a result, it increases the general effectiveness of education delivery in educational management organisations and schools at the federal, state/provincial, and local levels. All three of the essential elements of education teachers, textbooks, and interaction—are deficient in rural areas; however, some of these deficiencies can be compensated for by digital content and ICT-based interactions. More significantly, dynamic, eye-catching content made possible by ICT use seems to significantly improve student engagement, retention, and learning.

2.6 APPLICATIONS OF ICT IN ECONOMIC DEVELOPMENT

Information and communication technology plays a key role in facilitating information interchange, which is essential for the development of the rural community's economy. Geographical barriers can be broken down, rural areas can become more integrated into global economic systems, and the poor can benefit greatly from the effective use of ICT.

2.7 EMPLOYMENT

Technology Uses for Economic Development Information and communication technology plays a key role in facilitating information interchange, which is essential for the development of the rural community's economy. Geographical barriers can be broken down, rural areas can become more integrated into global economic systems, and the poor can benefit greatly from the effective use of ICT. Workplace work in rural regions can be created by ICT activities, especially for young people who lack the technical knowledge necessary to compete for work in cities. Alternatively, these people might be prevented from migrating by expensive search expenses or, in the case of women, social restrictions. It has been shown that ICT offers these individuals especially young women attractive career prospects.

In addition to producing direct income and jobs (which may be scarce), field interviews indicate that these young people's confidence is greatly boosted and that they serve as appealing role models for other young people in rural areas who may be considering non-traditional, non-farm rural employment opportunities. In India, the transaction costs associated with finding a job are very high. In general, employers may advertise openings more efficiently, job seekers can search more efficiently, and employers can screen applications more thoroughly before accepting them. Some of the organisations implementing rural ICT in India claim that the ability to overcome distance obstacles through simple Internet access has been a big benefit, as the prices for job seekers in villages and small towns have been particularly expensive.

2.8 GOVERNMENT INITIATIVE FOR RURAL DEVELOPMENT THROUGH ICT

One of the first radio programmes to support rural development was Rural Development Radio, also referred to as the Radio Farm Forum. From February through April of 1956, All India Radio (AIR) carried out the experiment in five districts of Maharashtra. Rural communities were arranged by the radio broadcasts to tune in twice a week at 6:30 p.m. on Sundays. The radio rural forum produced positive results, according to the summative impact evaluation. Leaders of villages, literate and illiterate people, farmers and non-farmers, and others claimed impressive knowledge gains from listening to radios.

- **Community Radio Initiative** During the post-liberalization period, the Indian government published its community radio broadcasting strategy. Community radio is anticipated to cover topics related to rural and urban life, agriculture, the environment, and health.
- **Community Television** : Doordarshan set a kind of world record when it installed more than 1000 low-power television transmission stations around the nation since the launch

of the INSAT satellite television system. The idea was for each station to broadcast regional television content aimed at promoting rural development. For this reason, many specialists in television were trained. As part of its plans to advance rural development, Doordarshan intends to provide local television to farmers and the impoverished in rural areas.

- **Gyan Sanchar:** Gyan Sanchar aims to provide affordable and cost-effective services to people in rural areas of India. This is collaboration between Bharat Sanchar Nigam Limited (BSNL), the Government of Madhya Pradesh (GoMP), and Canadian business groups including IBM Business Services and SaskTel International. This project aims to develop a model for expanding the use of communication and ICT in rural India.
- **E-Governance :** E-Governance reducing poverty and enhancing the environment can be directly impacted by better governance through the use of ICT. ICT is being used by governments more and more to provide services where citizens are most convenient. The goal of rural ICT applications is to bring state and federal government departments, cooperative unions, and district administration services right to the doorsteps of rural residents. Inland e-Seva The Andhra Pradesh government started the initiative to provide an e-governance system. These facilities are intended to give residents in rural India access to well-managed services. It has to do with paying local government bills, phone bills, and electricity bills in order to provide rewards right to their home.

2.9 CHALLENGES FACED BY ICT IN RURAL DEVELOPMENT

ICT infrastructure and capacity building in rural areas are still insufficient. As a result, ICT has not played its main role in the development of rural areas. Some of the problems faced by ICT are:

1. **Illiteracy :** Illiteracy is a massive problem for people from rural areas. The literacy rate is considerably low in rural areas as compared to urban areas. The condition is more unsatisfactory when we talk about Digital Literacy.
2. **Connectivity :** The majority of rural communities lack connectivity. A significant blackout in a remote area. Systems for continuous power supply are in place, however they don't seem to be able to handle power outages. The limited electricity supply in rural locations prevents the proper use of ICT applications, particularly at the village level. ICT encompasses a variety of devices that can be used independently or in conjunction with one another, in addition to the Internet. The connectivity should be much improved.

Another significant problem is the lack of high-quality UPS and generator sets, as well as the upkeep of these items at the village level.

3. **Infrastructure** : There is an acute shortage of required infrastructure like electricity, internet technology and methods of communication will influence the speed which postponed the implementation process. The primary point is the huge investment expected to build up a solid system with infrastructure.
4. **Poverty** : In India, the vast majority of people struggle to make ends meet and live in poverty. For them, getting on the internet is an expensive problem since setting up the phone lines needed to access the internet or sending emails is also too expensive in developing nations.
5. **Shortage of professionals** : Managers and trainers who are capable of implementing ICT at the grassroots level are severely lacking. The community (particularly farmers, young people, and beneficiaries) will find it extremely difficult to accept regular training of people in the acquisition of the requisite knowledge and skills through ICT-based applications.
1. **Acceptance in Rural People** : It is frequently assumed that any technology transfer to rural regions will be welcomed, but we have to take into consideration their own established cultural and traditional ways of doing things. Aside from other variables, user acceptance for the ICTs applications in rural areas is a key challenge.

2.10 CONCLUSION

Information and communication technology (ICT) has greatly aided in the development of the rural sector and is essential to its growth in many areas. It supports the growth of numerous industries in rural areas, such as healthcare, education, and agriculture. However, there is very little development because of the rural population's lack of growth and ICT understanding, even though this has a significant impact on the expansion of rural areas. In order for ICT to work more efficiently and for the rural sector to improve faster, rural residents need to be aware of its importance. The primary topics of this chapter are the various applications of ICT for rural development across several domains and the obstacles that ICT in rural development must overcome. My research concludes that technological advancements in ICTs have significantly decreased costs while increasing the volume and speed of information transport. Through improved access to governmental services, increased market expansion, increased job prospects, and increased information access, ICT in rural areas is the answer to gradually removing conventional development hurdles.

India's economy is expanding globally, and the country is continuing to progress in a number of areas, including rural development. Growth in rural areas is slower than in metropolitan areas. Despite the government's numerous policies and initiatives, rural development is still sluggish. Based on observations, the primary reason for rural areas' backwardness is a lack of knowledge and information about available facilities and programmes. In order to bring its rural population into line with the nation's rapidly evolving economy, India must enable them to access and use IT. Given that India's economy is based primarily on agriculture, its rural population is its most valuable resource, yet they also receive no other benefits. This study outlined a few ICT innovations that were specifically created with the rural sector in mind, taking into account end user knowledge, cost, and connectivity. This study also covered the several ICT applications related to the rural sector, including telemedicine, agriculture, and e-governance. To assess the efficacy of the programmes, a review of the numerous federal and state-level initiatives implemented by the Indian government to encourage the use of ICT for socioeconomic development in rural regions was also conducted.

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CHAPTER – 03

FUTURISTIC SENARIO OF ENTERPRENURES ENGAGED IN AREA OF GOAT MILK AND ITS PRODUCTS

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3.1 INTRODUCTION

Research in the past few decades has extended knowledge of composition of goat milk and of properties of its constituents. Goats of several European breeds produce milk of lower fat content in the tropics than in temperate zones. Fat, protein, and lactose contents of milk of dwarf goats are higher than those of other breeds. Fat globules of goat milk resemble those of cow milk in lipid composition and properties of the globule membrane, but goat milk lacks “agglutinin” which causes fat globules of cow milk to cluster when cooled. Five principal proteins of goat milk, α -lactalbumin, β -lactoglobulin, κ -casein, β -casein, and α_{s2} -casein, closely resemble their homologs in cow milk. Goat milk lacks a homolog of bovine β_{s1} -casein, the most abundant protein in cow milk. Caseinate micelles of goat milk contain more calcium and inorganic phosphorus, are less solvated and less heat stable, and lose β -casein more readily than bovine micelles. Activities of ribonuclease, lipase, and xanthine oxidase are less in goat than in cow milk. Goat milk contains more potassium and chloride but less orotic acid, N-acetyl neuraminic acid, folate, vitamin B₆, and vitamin B₁₂ than cow milk. Little work in the past decade has been on nutritive value of goat milk for humans except to describe cases of folate deficiency in infants.

Milk is considered as nearly complete human food and considered as the first food for the newly born off-spring. Goats (*Capra aegagrus hircus*) were the first species to be domesticated as livestock about 8000 BC in Mesopotamia, part of today’s Middle East. Goat milk production in India increased from 3.6 to 4.7 million tons during the year 2015-16 with an annual growth rate of 2.6%. The country stands first in goat milk production in the world by sharing 29% (CIRG, 2015-2016). Different varieties of cheese, yoghurt, ice cream, fluid milk and milk powder are produced from goat milk. Goat milk has traditionally been known for its medicinal properties and has recently gained importance in human health due to easy

digestibility and it's all round health promoting traits. Goat milk has advantages over cow or human milk in having higher digestibility of protein and fat, alkalinity, buffering capacity, and certain therapeutic values in medicine and human nutrition. Due to lack of availability of cow milk, goat milk and its products provide important daily food sources of protein, phosphate and calcium in developing countries. Goat milk is considered as "self-homogenized" milk.

3.2 GOAT MILK : BOON FOR LIFE

Milk has been one of the nutritious human diets since early civilization, however only cow and Buffalo milk has been popularized in India. Although for its nutritious and medicinal properties, goat milk has been consumed in rural areas, it has remained out of reach of urban dwellers. **Father of Nation Mahatma Gandhi** has preferred goat milk over other milk. As per available information, following qualities of goat milk makes it appropriate for young ones, growing children and aged people –

Due to smaller fat globules, goat milk is easily digestible by young ones and aged people. Goat milk has 35% medium chain fatty acids in comparison to 17% in cows, making it less prone to heart ailments and obesity. Goat milk can be taken by people allergic with cow/buffalo milk. Goat milk is rich in mineral contents. Goat milk is suitable for weak dilapidated patients, young ones, growing children, and people recovering from abscess, wounds and bone fractures. Goat consumes a lot of herbs and medicinal plants, making its milk more organic and of therapeutic (medicinal) value. A healthy, cleaned goat kept away from buck provides milk free from smells and children relishes it if some flavour is added.

Goat milk is naturally an excellent source of calcium, magnesium, and potassium. Additionally, goat milk contains the precursor to vitamin A in the milk fat which allows it to be readily bioavailable. Dairy production causes a number of environmental harms, including methane (CH₄), carbon dioxide (CO₂) and nitrous oxide (N₂O) emissions. But dairy goats actually contribute more emissions per unit of milk produced than cows. Goat milk may help improve heart health, reduce inflammation, strengthen bones, and treat anemia. Goat milk has higher amounts of calcium and magnesium than cow milk. Proponents of raw milk claim that it boasts more nutrients and is easier to digest than pasteurized milk.

Casein is a natural protein that is found in all milk, and many people have difficulty with the Alpha S1 casein found in cow milk and are allergic to cow dairy. Studies have shown that goat milk is very low in Alpha S1 casein and primarily contains Alpha S2 casein. Raw milk is also believed to contain enzymes that help people process lactose, the sugar in milk that some people cannot digest and "good bacteria" that contribute to a healthy gut.

A goat is a great source of income, particularly when a family receives more than one. Goats can be bred to produce two to three kids each year. Eventually, they multiply into a whole herd. With extra milk, cheese, meat and livestock, families can earn an income at market. The net income of majority of goat farmers (with zero-input) ranges from ` 2,000 to 3,000/adult female goat/ year with an average of ` 2,500. The ratio of profit: cost mostly ranged from 1.5 to 2:1. On average, the dairy goat enterprise contributed, correspondingly, about 15.2% and 4.8% to the total livestock and overall household income and was viable. Differences in gross and net margins across agroecological zones were attributed to milk prices.

3.3 CHEMICAL COMPOSITIONS OF GOAT MILK

Composition of goat milk are vary according to changes in diet, individuals, season, breed, species, feeding managements, environmental conditions, stage of the lactation, locality and condition of the udder. Goat milk is similar to cow milk in its basic composition. Caprine milk contains 12.2% total solids, 3.8% fat, 3.5% protein, 4.1% lactose, and 0.8% ash. It has more fat, protein, and ash and less lactose than cow milk. Goat milk contains slightly less total casein, but higher non-protein nitrogen than the cow counterpart. Goat milk and cow milk have 3 to 4 times greater levels of protein and ash than human milk. Total solids and caloric values of goat, cow, and human milks are similar. Goat milk differs from cow milk in having better digestibility, buffer capacity, alkalinity and therapeutic values. Fat of goat milk have higher physical properties i.e. surface tension, viscosity and specific gravity as compared to cow milk.

Table 1: Average composition of milk from goat, cow, buffalo and human

Component (Per cent)	Goat	Cow	Buffalo	Human
Water	87.5	87.7	83.2	86.7
Protein	3.4	3.2	4.5	1.2
Fat	3.8	3.6	6.7	4.0
Solid-not-fat	8.9	9.0	10.1	8.9
Lactose	4.1	4.7	4.5	6.9
Casein	2.4	2.6	-	0.4
Total ash	0.8	0.7	0.8	0.3

(Source: Park *et al.*, 2007)

▪ Milk Lipid

Major differences between goat and cow milk is physicochemical structure and composition of milk fats. The fat globules range between 1 and 10 μm in both goat and cow milk. In respect to free lipids, goat milk has higher values than that of cow milk. Goat milk contains 97–99% of free lipids and 1–3% bound lipids of total milk fat. Goat milk contained 96.8% triglycerides, 2.2% diglycerides and 0.9% monoglycerides. Goat milk is rich in short- and medium-chain fatty acids (FAs) compared to the cow milk.

Table 2: Fatty acid composition (Per cent of total fatty acids) of goat milk from Granadina goats and cow milk

Fatty Acids	Goat milk	Cow Milk
Butyric acid	1.27	3.84
Caproic acid	3.28	2.28
Caprylic acid	3.68	1.69
Capric acid	11.07	3.36
Lauric acid	4.45	3.83
Myristic acid	9.92	11.24
Palmitic acid	25.64	32.24
Stearic acid	9.92	11.06
Oleic acid	23.8	21.72
Linoleic acid	2.72	2.41
CLA tot	0.68	0.4
α -linolenic acid	0.53	0.25
PUFA n-6	2.81	2.53
PUFA n-3	0.51	0.25
PUFA tot	4.08	10.49

(Source: Ceballos *et al.*, 2009)

The short-chain FAs represent 15-18%. The short- and medium-chain FAs are partly responsible for the characteristic “goaty” odor. The medium-chain triglycerides were found to be 30.83% and 25.16% in goat and cow milk, respectively, whereas the long-chain triglycerides were 53.95% and 64.01% in the same order. Cholesterol contents of goat, cow and human milk were reported as 11, 14, and 14 mg/100 g milk, respectively. Goat milk consists more of the linoleic and arachidonic acids and CLAs. Total CLA content of goat milk is 35.75 mg/100 g while it is only 15.62 mg/100 g in cow milk.

▪ Amino Acids and Protein

The amounts of free amino acids are different between goat and cow milk. The higher content of cysteine (derived from cystine) has been shown to improve intestinal absorption of copper and iron in a rat model of malabsorption syndrome.

Table 3: Average amino acid composition (g/100 g milk) in proteins of goat and cow milk

Amino Acids	Goat milk	Cow Milk	Difference (per cent) for Goat Milk
Essential amino acids			
Tryptophan	0.044	0.046	
Threonine	0.163	0.149	+9
Isoleucine	0.207	0.199	+4
Leucine	0.314	0.322	
Lysine	0.290	0.261	+11
Methionine	0.080	0.083	
Cystine	0.046	0.030	+53
Phenylalanine	0.155	0.159	
Tyrosine	0.179	0.159	+13
Valine	0.240	0.220	+9
Non-essential amino acids			
Arginine	0.119	0.119	
Histidine	0.089	0.089	
Alanine	0.118	0.113	
Aspartic acid	0.210	0.250	
Glutamic acid	0.626	0.689	
Glycine	0.050	0.070	
Proline	0.368	0.319	
Serine	0.181	0.179	

(Source: Posati and Orr, 1976)

Taurine is the most representative free amino acid in goat milk and the concentration is much higher than in cow milk. There are two distinct phases of milk proteins; micellar phase composed of casein and a soluble composed of whey proteins. The caseins constitute about 80% of the proteins and are classified as α_1 , α_2 , β and κ -caseins, while the major whey

proteins are β -lactoglobulin and α -lactalbumin. Goat milk contains lower amounts of the α -casein, higher amounts of the β -casein fractions and equal amounts of the κ -casein fractions compared to cow milk. The casein micelles in goat milk differ from those in cow milk in having greater β -casein, more calcium & phosphorus and lower heat stability. Two types of β -lactoglobulin have been identified in goat milk and three variants of α -lactalbumin.

▪ Lactose

Lactose is a major carbohydrate present in goat milk but content slightly low as compared to cow milk. Other carbohydrates found in goat milk are oligosaccharides, glycopeptides, glycoproteins and nucleotides in small amounts. Goat milk is significantly rich in lactose-derived oligosaccharides compared to cow milk. Milk oligosaccharides are thought to be beneficial to human nutrition because of their prebiotic and anti-infective properties.

▪ Mineral and Vitamins

Goat milk is reported to have higher content of potassium, calcium, chloride, phosphorus, selenium, zinc and copper than cow milk. Goat milk has a higher vitamin A content than cow milk because goats convert all β -carotene from foods into vitamin A.

Table 4: Proximate vitamins (per 100 g) content in milk of various species

Component	Goat milk	Cow milk	Buffalo milk	Human milk
Vitamin A (IU)	185	126	177	190
Vitamin D (IU)	2.3	2.0	-	1.4
Thiamin (mg)	0.07	10.05	0.04	0.02
Riboflavin (mg)	0.21	0.16	0.13	0.02
Pantothenic acid (mg)	0.31	0.32	0.20	0.20
Niacin (mg)	0.27	0.08	0.09	0.17
Vitamin B ₆ (mg)	0.05	0.04	0.02	0.01
Folic acid (μ g)	1.0	5.0	3.3	5.5
Vitamin B ₁₂ (μ g)	0.07	0.36	0.14	0.03
Biotin (μ g)	1.5	2.0	-	0.40
Vitamin C (mg)	1.29	0.94	1.00	5.00
Energy (kcal/100 ml)	70.0	69.0	117.0	68.0

(Source: Park *et al.*, 2007)

Both goat and cow milk have low concentrations of vitamin B6 and vitamin D, which are both important during infancy. Goat milk is deficient in folic acid and vitamin B12, which cause 'goat milk anemia'. Vitamin C is a well-known water-soluble antioxidant that is found in greater amounts in goat milk than in cow milk.

Table 5: Proximate minerals (g/100 g) content in milk of various species

Component	Goat milk	Cow milk	Buffalo milk	Human milk
Sodium	41	44	35	15
Potassium	181	152	92	55
Calcium	134	122	112	33
Magnesium	16	12	8	4
Phosphorus	121	119	99	43
Sulphur	28	32	-	14
Iron	0.07	0.08	0.16	0.20
Chloride	150	100	-	60
Se (μg)	1.33	0.96	-	1.52
Copper (mg)	0.05	0.06	0.04	0.06
Manganese (mg)	0.03	0.02	0.02	0.07
Zinc (mg)	0.56	0.53	0.41	0.38
Iodine (mg)	0.02	0.02	-	0.01

(Source: Park *et al.*, 2007)

3.5 NUTRITIVE VALUES OF GOAT MILK

▪ Digestibility and Micronutrient Absorption

The most appearing property of goat milk is superior digestibility and absorption of micronutrients. Digestibility of goat milk is highly enhanced by nature of the proteins and the fat molecules. Goat milk does not contain the protein agglutinin that promotes clustering of fat globules. The absence of clustering facilitates rapid digestion and absorption.

▪ Antimicrobial Activity

Goat milk contains high levels of medium chain fatty acids, such as caprylic and capric acids. These fatty acids are highly antimicrobial. Capric and caprylic acids are used in dietary supplements to inhibit the growth of *Candida albicans* and other yeast species.

- **Alkalinizes the Blood and the Intestine**

Goat milk helps to increase the pH of the blood stream. It is the only dairy product with the highest amount of the L-glutamine. Acidic blood and low intestinal pH levels have been associated with fatigue, headaches, muscle aches and blood sugar imbalances.

- **Less allergenic and Brain Development**

In the USA and Canada the department of pediatrics has recommended that cow's milk be avoided for children between 0-6 months due incidences of allergy. Sialic acid profile of goat colostrums milk is similar to human milk and helps in brain development.

- **Dengue Fever**

Dengue fever is mainly transmitted to humans by *Aedes aegypti* mosquito. So, for treating this disease goat milk and milk products are mostly preferred. Deficiency of selenium and decrease in platelet count are the main complications of dengue fever. Goat milk as well as its products is richest source of selenium.

- **Growth Factors for Infants**

Goat milk contains high levels of growth factors similar to those found in human milk making it an essential diet for the infants. The Transforming Growth Factors (TGF) has a physiological role in maintaining regular functionality of the infant.

- **Prevention of Inflammatory Bowel Disease**

Oligosaccharides from goat milk are shown to have an anti-inflammatory effect. The expected decrease in body weight, increased colon size and extension of necrotic lesions are prevented by the oligosaccharides.

- **Cardiovascular Diseases (CVD)**

Goat milk is rich in medium chain triglycerides (MCT) including caproic, caprylic and capric acids. These MCT have a lowering effect on plasma cholesterol in rat models and act as anti-atherogenic.

- **Prevention of Milk Allergy**

The proteins α_1 casein and β -lactoglobulin are important allergens in cow milk allergy. Since the content of α_1 casein is very high in cow milk but relatively low in goat milk, the latter has been suggested as an alternative milk source for cow milk allergies.

- **Immunomodulatory Activity and Immunity Booster**

Jirilloet *al.* (2010) showed immune modulatory effects from goat milk both in *in vitro* and human studies. The effects of goat milk on human blood cells in terms of nitric oxide (NO)

and cytokine release. The results demonstrated that goat milk was able to activate NO release from blood cells as well as triggering of cytokine production. Selenium is one of the key component for the immune system functionality.

- **Anti-Carcinogenic Effect**

Goat milk has a high content of conjugated linoleic acid. Anti-carcinogenic properties of CLA have been reported against mammary and colon cancer in animal models, as well as in vitro models of human melanoma, colorectal and breast cancer.

- **Effect on Infancy Intake**

Basnet *et al.* (2010) reported an infant was exclusively fed goat milk, which led to azotemia (abnormally high levels of nitrogen compounds in the blood), hypernatremia (electrolyte imbalance caused by elevated sodium levels) and hemorrhages in the brain but when it gave malnourished children (1-5 years) goat or cow milk, weight gain and fat absorption were similar in both groups.

- **Therapeutic Value of Goat Milk**

Kullisaaret *al.* (2003) showed antioxidative and anti-atherogenic effects from fermented goat milk. Minerviniet *al.* (2009) developed fermented goat milk with a mixed starter culture which resulted in production of GABA and provoked an in vitro ACE-inhibitory activity, which counteract high blood pressure. Sannaet *al.* 2(005) used a mix of *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. Bulgaricus* when fermenting goat milk which is resulted in to a yogurt with a significant quantity of folate and good sensory attributes.

3.6 MILK PRODUCTS

Various goat milk products, including fluid, fermented, frozen, condensed, and dehydrated milk products, are produced in many countries. Goat milk products especially cheeses and yogurt are very popular in the Mediterranean peninsula, the Middle East, Southern Russia and the Indian subcontinent

- **Liquid Milk Products**

Goat milk is white in colour and has a stronger flavour. Ahmed *et al.* (1992) used fruit Guava, Orange and Fig for fortifying skim goat milk in order to prepare low fat beverages. Pruksasri and Supee (2013) assessed the feasibility of producing goat milk containing galactooligosaccharides (GOS) by treating milk with the enzyme β -galactosidase. Milk contains GOS had higher overall acceptability compare to regular milk.

▪ **Butter and Ghee**

Rodriguez *et al.* (2003) optimized processing parameters for manufacture of butter from cultured cream. This cultured formulation achieved optimal sensory quality in appearance, flavour, texture, and overall quality. Bindal and Wadhwa (1993) demonstrated that goat ghee has a higher liquid fraction (69%) compared with cow ghee (30.5%) or buffalo ghee (36%). Levels of glycerides were also higher in ghee prepared from goat milk as compared to cow and buffalo milks. The melting point and softening point of ghee prepared from goat milk were also low.

▪ **Milk Powder**

The freeze, roller and spray drying techniques were used in manufacture of milk powder from goat milk. Reddy *et al.* (2014) optimized the processing conditions for manufacture of spray dried from goat milk. A mixed fruit flavour was added to the concentrated milk to avoid the goaty flavour in the final powder. The mean values of proximate composition of spray dried powder viz., moisture content, fat, protein, carbohydrates, ash and titratable acidity were 4.08%, 26.85%, 25.48%, 36.99%, 6.60% and 0.14%, respectively.

▪ **Yoghurt and Fermented Milk Products**

Fermented goat milk incorporating live probiotic cells have good nutritive and therapeutic properties. A mixed starter has been successfully used for fermentation of goats milk. Beyond all nutritive features of goat milk, one of the major disadvantages is non-existent of folic acid content. This disadvantage could be solved by using folate producing bacteria during fermentation by use in *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. bulgaricus* in goat milk results in yoghurt with significant quantity of folate and good sensory features. Ehirim and Onyeneke (2013) made yoghurt with cows and with goat milk. Patel and Roy (2016) compared the quality of yoghurt using instrument texture analyser. Paz *et al.* (2014) showed the technological potential and adequacy of using goat milk to produce potentially symbiotic yogurt. Bano *et al.* (2011) concluded that mixing 75% goat milk and 25% sheep milk in manufacture of yoghurt improved color, flavour and texture scores of the resultant yoghurt. Damunupola *et al.* (2014) suggested that the incorporation of beetroot extract could mask the goaty-flavor and goaty-odor of the yogurt made from goat milk. Gurselet *et al.* (2016) made yoghurt with the fortification of 2% (w/v) each of skim goat milk powder, sodium caseinate, whey protein concentrate, whey protein isolate, or yogurt texture improver. Labneh is a delicious popular cultured dairy product which produced from yoghurt coagulates (Abbas *et al.*, 1999). Goat labneh is higher in ash, but fat and protein

contents were the same as cow labneh. Mehaia (2005) studied the chemical composition and sensory evaluation of fresh labneh made from goat milk, using ultrafiltration (UF) and traditional processes.

▪ **Cheese**

Goat milk cheese was originated in Mesopotamia. A piquant and peppery sharp flavor observed in ripened goat milk cheese due to presence of greater proportion of short & medium chain fatty acids in goat milk. There are three categories of cheese which produced from goat milk viz traditional cheeses made at home, cheeses produced on farm scale and cheese made from mixed sheep and goat milks. Loewenstein *et al.*, (1980) and Park and Guo (2006a, b) described goat milk whey cheese, the process where caramelized lactose in concentrated whey is combined with fat and whey proteins to make Gjetost cheese. Mehaia (2002) made fresh soft white cheese (Domiaty-type) from goat milk using ultrafiltration (UF) and conventional processes. El-Sheikh *et al.* (2011) successfully made blue cheese from goat milk. Attulla *et al.* (2014) fortified goat cheese with caramel, cocoa and cocoa with walnuts are corresponding high quality protein ingredient for sweet spreadable cheese and concluded that fortified sweet goat cheese with cocoa and walnut could be regarded as Egyptian economic products and nourished for human consumption especially for children feeding.

▪ **Ice cream and Frozen Desserts**

Silva *et al.* (2016) manufactured ice cream enriched with different amounts of carob powder. They reported that goat milk ice cream containing carob powder which was added @ 12% was found to be most acceptable with respect to all sensory attributes. Ranadheera *et al.* (2013) developed chocolate flavored probiotic ice cream made from goat milk using a probiotic bacterial culture. Konar and Akin (1997) and Pandya and Ghodke (2007) compared the chemical, physical and organoleptic qualities of ice cream made from cow, goat and sheep milk for their suitability for ice cream production. Goat milk produced the most acceptable ice cream followed by cow milk. Goat milk frozen yogurt was prepared using cacha (*Spondias mombin* L.) flavour. The sensory acceptance test indicated that formulations containing 20% and 30% cacha pulp were the most accepted (Keily *et al.*, 2016).

▪ **Other Traditional Indian Dairy Products**

Several Indian traditional products such as ghee, chakka, shrikhand, paneer, chenna, etc. can be made from the goat milk. Joshi *et al.* (1991) made chenna from goat milk and have soft body and smooth texture. Bhargava *et al.* (1992) investigated influence of fat percentage on

the yields and qualities of chenna and rasogolla from goat milk. Sharma *et al.* (1995) investigated the method of chenna making from Jamunapari and Barbari goat milk using different level of coagulant. Vijiet *al.* (2017) prepared paneer by the admixture of goat and buffalo milk at different proportion. Agnihotri and Pal (1996) standardize the method of shrikhand production. Bhat *et al.* (2016) made a novel goat milk bar using rose flower extracts and natural sweeteners. Singh *et al.* (2018) made goat milk shrikhand blended with sapota pulp and betel leaf extract. Ramlingam *et al.* (2009) prepared dahi utilizing goat milk

▪ **Application in Cosmetics**

High volume of cosmetic products are produced from goat milk, including soaps, creams, body lotions, shampoos, hair conditioners, after shave lotions, which are marketed in many countries such as US and Switzerland. Goat milk contains capric and caprylic acids which enhance permeability in skin, used as a carrier of other chemical compounds in lotions and creams.

3.7 LIMITATIONS OF GOAT MILK

Goat milk contains virtually no folic acid. To be adequate as an infant formula it has to be fortified. Goat milk is an apocrine secretion. Apocrine is a type of glandular secretion where the secreting cell is released along with the milk. The milk has high levels of somatic cell counts which are not desirable.

3.8 CONCLUSION

Goat milk and its product is a rich source of more bioavailable proteins, fats, vitamins and minerals with great suitability for infant foods. Due to its high nutritive value and physiological properties, goat milk should be promoted in the developing countries like India, where malnutrition and diseases are more prevalent along with high poverty levels. The maintenance cost, general management and feeding of dairy goat is very low. But commercialization and utilization of goat milk is still lacking in developing countries. And scientific community has lack of information related to its use for commercialization. This area needs more research to do.

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CHAPTER – 04

INFORMATION & COMMUNICATION TECHNOLOGY FOR RURAL DEVELOPMENT

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4.1 INTRODUCTION

In order to interconnect electronic gadgets, improve the availability of information, humanize communication networks, and promote socioeconomic development, ICT, or information and communication technology, has been playing an essential part in the development of rural areas. Here are some essential domains where ICT can be used to promote rural development:

- ❖ **Digital Infrastructure:** It is essential for the development and enhancement of the internet infrastructure in rural areas, as well as access to broadband and mobile networks. This makes it possible to deploy a range of ICT services and applications.
- ❖ **E-Governance:** By implementing e-governance projects, public services including computerized property records, online applications for government programs, and e-voting systems can be delivered efficiently. As a result, fraud is reduced, transparency has risen, and overall governance is improved.
- ❖ **Agriculture and Rural Livelihoods:** ICT helps farmers to provide real-time information on weather conditions, best agricultural practices and market prices. Today number of Mobile applications and online platforms be able to help farmers make informed to take decisions, access financial services, and connect with potential buyers.
- ❖ **Education and Skill Development:** ICT tools and digital learning platforms helping students as well as teachers to get quality education in rural areas. Number of virtual classrooms, educational apps and online courses enable remote learning, capacity building and vocational training, in that way to empowering individuals and improving employability.
- ❖ **Healthcare Services:** ICT can be helpful to improve the delivery of healthcare services in rural areas. Now patients can consult doctors remotely using video conferencing through telemedicine.

- ❖ **Financial Inclusion:** ICT can be used to expand financial services to the rural population like microfinance platforms, mobile banking and digital wallets enabling protected transactions, investments, and right to use of credit. ICT promotes startups and entrepreneurship as well as overall economic development.
- ❖ **Entrepreneurship and Market Access:** ICT provide different facilities to the rural entrepreneurs to access local as well as global markets by connecting with potential customers, suppliers, and investors. Online Marketplaces, E-commerce platforms and digital marketing tools facilitate rural businesses to get bigger their reach and spread their customer base.
- ❖ **Community Development and Social Services:** ICT and its tools are using to support community-driven development initiatives by allowing the collaboration among different communities to exchange the knowledge and information.

4.2 DIGITAL INFRASTRUCTURE

Digital infrastructure is a fundamental component of the digital services and networks that are essential for the preservation of digital connectivity and the provision of digital services. Strengthening the digital infrastructure of rural areas is essential in order to bridge the digital gap and guarantee that rural communities have access to a dependable and fast internet connection. The following are some of the key elements of digital infrastructure for rural areas:

4.1.1 Broadband Connectivity: The development of broadband infrastructure is essential for the provision of high-quality internet connectivity to rural populations. The implementation of Wireless Broadband technologies, fiber optic cables and satellite internet solutions is essential for the rural regions. Governments and telecommunications operators can work together to expand broadband coverage to under-served rural areas

4.1.2 Mobile Network : It is important to improve mobile network reach in rural areas where the capacity of landline infrastructure is limited. Building and upgrading mobile network towers, deploying 3G/4G/5G technology and optimizing coverage can improve mobile connectivity and facilitate access to digital services through Smartphone.

4.1.3 Power Source: Uninterrupted electrical power supply is a requirement of digital infrastructure. In rural areas, where access to electricity is not perfect, it is expected that efforts will be made to ensure a continuous source of power to operate digital infrastructure devices. This could involve solar solutions, mini-grids or hybrid energy systems to overcome energy challenges.

4.1.4 Data Center and Cloud Infrastructure: Developing data centers and cloud infrastructure near rural areas can improve the availability of digital services and enable local businesses and organizations to take advantage of cloud computing resources. This reduces the need for widespread local infrastructure and promotes efficient use of resources.

4.1.5 Cyber Security Measures: Strengthening cybersecurity measures is essential to protect digital infrastructure and ensure the privacy and security of rural users. Implementing firewalls, encryption protocols, and educating users on online security best practices can mitigate cyber threats and build trust in digital services.

1.6 Cooperation and Cooperation : Public-private partnerships can play an important role in improving digital infrastructure in rural areas. Governments, telecommunications companies, technology providers and community organizations can work together to share resources, expertise and investments to accelerate the deployment of digital infrastructure.

4.3 ELECTRONIC GOVERNANCE

E-governance refers to the use of information and communications technology (ICT) to transform government service delivery, improve transparency, increase citizen participation and streamline administrative processes. In the context of rural development, e-governance initiatives can play a key role in empowering rural communities, improving governance and enhancing the overall quality of public services. Here are some key aspects of e-government in rural areas:

4.3.1 Providing Online Services : E-governance allows rural residents to access government services online, reducing the need to visit government offices. This includes services such as applying for licenses and permits, accessing land records, obtaining birth and death certificates, and filing tax returns. Online portals and mobile applications can be developed to facilitate convenient and efficient service delivery.

4.3.2 Digitalization of Government Processes : E-governance involves digitizing government processes and workflows, eliminating paperwork and manual intervention. This can streamline administrative procedures, reduce bureaucracy and improve the speed and efficiency of service delivery. Digitizing processes such as procurement, licensing and public records management can bring transparency and accountability to rural governance.

4.3.3 People's Participation and Participation : E-governance platforms can facilitate citizen engagement and participation in the decision-making process. Rural residents can give opinions, submit complaints and participate in online consultations through dedicated

portals or social networks. This promotes inclusion, allows government to understand people's needs and fosters a sense of ownership in rural communities.

4.3.4 Transparent and Public Governance : E-governance promotes transparency by making government information, policies and data easily accessible to citizens. Online portals can provide information on government projects, budgets and public spending, allowing rural residents to monitor and hold authorities accountable. Open data initiatives can provide access to government data sets, allowing citizens and organizations to analyze and use data to make informed decisions.

4.3.5 Digital Identification and Authentication: Establishing robust digital identity systems, such as unique identifiers or digital authentication mechanisms, can enable rural people to access e-governance services securely. Digital ID cards or biometric authentication can be used to verify identity to benefit from government services and ensure transaction integrity.

4.3.6 Building digital capacity and understanding : It is important to increase digital literacy and train rural people to use e-governance platforms. Training programs can be conducted to improve digital skills and raise people's awareness about online use.

4.4 AGRICULTURE AND RURAL LIVELIHOODS

Agriculture and rural livelihoods are essential elements of rural development and harnessing information and communications technology (ICT) can bring enormous benefits to these sectors. IT solutions can provide farmers and rural communities with access to valuable information, market opportunities, financial services and knowledge sharing platforms. Here are some ways IT can support agricultural and rural livelihoods:

4.4.1 Access to information : IT tools, such as mobile applications, web portals and SMS services can provide farmers with real-time information on weather conditions, market prices, crop diseases and other best agricultural practices. This allows farmers to make informed decisions about crop selection, planting and harvesting timing, and market selection.

4.4.2 Market linkage : IT platforms can directly connect rural farmers with buyers, wholesalers and retailers, eliminating middlemen and improving market access. Online marketplaces, mobile apps, and SMS market information services can facilitate price discovery, enable direct sales, and connect farmers to a broader customer base.

4.4.3 Comprehensive Finance : IT solutions can improve rural communities' financial access by providing access to mobile banking, digital wallets, and microfinance platforms. These

tools enable farmers to access financial services, receive payments, save money and access credit for agricultural inputs and equipment.

4.4.4 Agricultural extension services : ICT can improve the reach and effectiveness of agricultural extension services by providing remote consultation and guidance to farmers. Interactive voice response (IVR) systems, mobile applications and online platforms can provide extension information, expert advice and troubleshooting solutions to farmers in remote areas.

4.4.5 Precision Agriculture : IT tools, such as remote sensing, geographic information systems (GIS) and drones, can be used in precision agriculture to optimize resource use, monitor plant health planting and increasing productivity. Remote sensing data can provide information about soil moisture, nutrient levels and pest infestations, allowing farmers to take targeted actions.

4.4.6 Agricultural Management System: IT platforms can provide farmers with farm management systems to streamline record keeping, inventory management, and crop planning. These systems can track inputs, monitor agricultural activities, and generate reports for better decision making and compliance with agricultural standards and certifications.

4.4.7 Farmer Education and Training: E-learning platforms and digital training resources can provide agricultural education and training to rural farmers. Online courses, videos and interactive modules can provide farmers with knowledge on improved farming techniques, crop diversification, value addition and post-harvest management.

4.4.8 Agricultural Cooperatives and Networks: IT platforms can facilitate the formation of agricultural cooperatives and networks, allowing farmers to collaborate, share resources, and collectively market their products. Online forums, social media groups and digital platforms can promote knowledge exchange, peer-to-peer learning and the ability to collectively bargain.

4.4.9 Climate resilience : IT can contribute to enhancing climate resilience in agriculture by providing early warning systems for extreme weather events, facilitating climate-smart agricultural practices. Climate and support climate change adaptation and mitigation strategies.

4.4.10 Agricultural technology innovation : IT can promote agricultural technology innovation in rural areas, encouraging the development of smart farming solutions, sensor-based technology, agricultural automation and supply chain management systems from farm

to market. This can improve productivity, reduce post-harvest losses and create opportunities for rural entrepreneurs.

4.5 EDUCATION AND SKILL DEVELOPMENT

Education and skills development are essential to empower individuals, improve livelihoods and promote socio-economic growth in rural areas. Information and communications technology (ICT) can play an important role in expanding access to quality education, providing vocational training opportunities and promoting lifelong learning in communities. Here's how IT can support education and skills development in rural areas:

4.5.1 Digital Learning Platform: Tools, such as e-learning platforms, educational websites, and learning management systems, can provide access to educational resources and courses. These platforms offer interactive lessons, instructional videos, and assessments, allowing rural students to learn at their own pace and access quality educational content.

4.5.2 Virtual Classroom: ICT facilitates virtual classrooms and video conferencing, allowing rural students to attend live classes, interact with teachers, and collaborate with friends from different locations. Virtual classrooms can bridge the gap in access to qualified teachers and facilitate remote learning opportunities.

4.5.3 Open Educational Resources: ICT enables the sharing and dissemination of open educational resources (OER) in rural areas. OER platforms provide free and easily accessible educational materials, including textbooks, lectures, and multimedia resources. This reduces the cost of instructional materials and promotes independent learning.

4.5.4 Digital Literacy Program: ICT can be used to provide digital literacy training to students, teachers, and community members in rural areas. Training programs may focus on basic computer skills, Internet use, online safety and information literacy. Digital literacy is essential for students to be able to navigate the digital landscape and make effective use of educational resources.

4.5.5 Professional Training: IT tools can support vocational training programs in rural areas, providing skills development in fields such as agriculture, healthcare, hospitality and business. Online courses, simulations, and virtual training modules can provide real-world skills and enhance the employability of rural youth.

4.5.6 Learning On Mobile Devices: Mobile devices and applications can deliver educational content and training directly to students and learners in rural areas. Mobile learning initiatives take advantage of the widespread availability of mobile phones to deliver concise

lessons, quizzes, and educational games. This approach ensures flexibility and accessibility, especially in areas with limited Internet connectivity.

4.5.7 Distance Learning: IT facilitates distance learning programs, allowing rural students to pursue higher education and professional courses without having to travel to urban areas. Online degree programs, virtual libraries, and remote testing systems provide rural learners with access to more educational opportunities.

4.5.8 Digital Skills for Livelihoods : IT can provide training in digital skills related to livelihoods and entrepreneurship. This includes teaching rural communities about online business models, digital marketing, e-commerce platforms, and how to use digital tools for financial management. These skills enhance income-generating opportunities and enable individuals to establish and maintain businesses.

4.5.9 Learning Management System for Schools : IT can support the implementation of learning management systems (LMS) in rural schools, allowing teachers to create and teach online lessons, manage student progress, and provide feedback. LMS platforms improve administrative efficiency and promote student engagement and collaboration.

4.5.10 Community Learning Center : The establishment of community learning centers equipped with IT infrastructure can provide access to educational resources, computers and internet connectivity to rural communities. These centers can serve as hubs for online learning, skills development programs, and digital literacy training.

4.6 HEALTHCARE SERVICES

Health services are of primary importance in rural areas, where access to quality health facilities may be limited. Information and communications technology (ICT) can significantly improve health care delivery, support telemedicine, improve health care management systems, and support campaigns to promote health care. Increase health awareness in rural communities. Here's how IT can support health services in rural areas:

4.6.1 Telemedicine : ICT enables remote health consultations through telemedicine platforms. Patients in rural areas can consult with healthcare professionals via video conferencing, giving them timely access to medical consultation, diagnosis and treatment. Telemedicine reduces the need to travel to remote health care facilities, especially for routine exams, follow-ups, and non-emergency conditions.

4.6.2 Electronic Health Records (EHR): Digital electronic health records management systems can increase healthcare efficiency and improve patient care in rural areas. EHR

systems enable the secure storage, retrieval, and sharing of patient information, ensuring continuity of care and reducing duplication of tests or treatments.

4.6.3 Mobile Health Application (mHealth): Mobile apps can provide healthcare information, reminders, and advice directly to rural communities. mHealth apps can provide features such as symptom checks, medication reminders, health monitoring, and access to educational resources. These apps promote health awareness, encourage preventative care, and facilitate self-management of certain health conditions.

4.6.4 Health Monitoring Devices: IT enables the use of wearable devices and remote health monitoring tools in rural areas. Patients with chronic diseases can use devices such as blood pressure monitors, blood glucose monitors, and activity trackers to monitor their health parameters. Data from these devices can be shared with healthcare providers for remote monitoring and rapid intervention.

4.6.5 Health Information Exchange: IT systems facilitate the exchange of medical information between healthcare providers, ensuring continuity of care. In rural areas, where patients may need to travel to different health care facilities, electronic health information exchange allows for efficient sharing of medical records, test results, and treatment plans. Treatment, thereby improving coordination among medical professionals.

4.6.6 Health Awareness and Education: IT platforms, such as websites, mobile applications, and SMS services, can provide medical information, preventive care instructions, and health education materials to rural communities. These platforms can increase awareness about common diseases, hygiene practices, vaccination schedules, and maternal and child health, thereby allowing individuals to make informed healthcare decisions.

4.6.7 Emergency Response System: IT can improve emergency response systems in rural areas. Mobile apps, toll-free help lines and text message services can be used to report emergencies and seek immediate medical help. ICT-based emergency response systems can help dispatch medical personnel, ambulances or air support to rural areas in a timely manner.

4.6.8 Health Analysis and Data Management: IT tools can be used to collect, analyze and manage health data in rural areas. Data analytics can identify disease trends, track public health indicators, and inform health planning and resource allocation. IT-enabled data management systems contribute to effective healthcare delivery, resource optimization, and evidence-based decision making.

4.6.9 Training and Capacity Building: IT can support training programs for health workers in rural areas. Online learning platforms, webinars and teleconferences enable dissemination of medical knowledge, skills development and continuing education for healthcare professionals. Virtual training programs can be customized to address the specific health challenges facing rural communities.

4.6.10 Telemedicine Camp: ICT can facilitate the organization of telemedicine camps in rural areas. These camps bring together healthcare professionals, diagnostic services and medical equipment to provide direct healthcare to underserved communities. ICT tools can facilitate planning, coordination and data collection in these camps.

4.7 FINANCIAL INCLUSION

Financial inclusion refers to providing access to appropriate and affordable financial services to individuals and communities, especially those who are underserved or unbanked. Information and communications technology (ICT) plays an important role in promoting financial inclusion in rural areas by overcoming barriers such as geographical distance, lack of infrastructure and banking services. Here's how IT can support financial inclusion in rural communities:

4.7.1 Mobile Banking and Digital Payments: IT enables mobile banking, allowing rural residents to access basic banking services through their mobile phones. Mobile banking apps and USSD-based services enable account opening, balance inquiries, money transfers, and bill payments. Digital payment systems, such as mobile wallets and payment apps, enable secure and convenient transactions, reducing reliance on cash.

4.7.2 Agent Banking Services: IT facilitates the formation of a network of banking agents in rural areas. Local agents equipped with mobile devices can provide basic banking services, including cash deposits, withdrawals, account opening and customer verification. Agent banking expands the reach of financial services, making banking services more accessible to rural communities.

4.7.3 Digital Finance Knowledge: IT tools can be used to provide digital financial literacy training to rural people. Training programs and educational content can be delivered through mobile applications, online platforms, and interactive modules. Digital financial literacy equips individuals with the knowledge and skills to manage finances understand banking services and make informed financial decisions.

4.7.4 Credit and Microfinance : ICT enables the provision of credit and microfinance services to rural and small businesses. The digital platform streamlines loan applications, credit assessments and disbursements. Mobile credit scoring models, transaction history and alternative data sources are helping to expand access to credit for those with limited traditional credit histories.

4.7.5 Remittance and Remittance : IT facilitates secure and affordable remittance services for rural communities. Digital remittance platforms, mobile remittances, and blockchain-based solutions help reduce the costs and time involved in sending and receiving money. This benefits rural people, who rely on remittances from family members working in urban areas or abroad.

4.7.6 Insurance Services : IT can support the provision of insurance services to rural communities, including agricultural insurance, health insurance and micro insurance. Digital insurance platforms streamline policy issuance, claims processing and premium payments. These platforms help reduce risks faced by rural people and protect their livelihoods.

4.7.7 E-commerce and Market Access : The IT platform allows rural entrepreneurs and farmers to participate in e-commerce platforms, thereby expanding the scope of their operations beyond local borders. Online marketplaces, mobile apps and digital platforms connect rural producers with buyers, improving market access and income generation opportunities.

4.7.8 Data analysis and Risk Assessment: IT tools can leverage data analytics to assess the creditworthiness and financial behavior of individuals in rural areas. Big data analytics, machine learning, and artificial intelligence algorithms can be used to analyze transaction data, mobile usage patterns, and other alternative data sources to assess risk and tailor financial products to suit rural people.

4.7.9 Government-to-Person (G2P) Payments : IT facilitates government-to-citizen payments, such as social benefits, subsidies and pensions, directly into rural individuals' bank accounts or mobile wallets. Digital disbursement improves transparency, reduces leakages and ensures timely delivery of government support.

4.7.10 Partnership and Collaboration : Collaboration between financial institutions, technology providers, government agencies and community organizations is critical for the effective implementation of ICT-based financial inclusion initiatives in the region. Public-private partnerships and collaboration with local organizations help ensure sustainability, user adoption and relevance of financial inclusion interventions.

4.8 ENTREPRENEURSHIP AND MARKET ACCESS

Entrepreneurship and market access are key drivers of economic growth and development in rural areas. Information and communications technology (ICT) can play an important role in promoting entrepreneurship, facilitating market access and promoting the development of rural businesses. Here's how IT can support entrepreneurship and market access in rural communities:

4.8.1 Business Development and Training: IT tools can provide aspiring rural entrepreneurs with access to business development resources, training programs, and consulting. Online platforms, webinars, and e-learning modules can offer entrepreneurship courses, business planning consulting, and skills development programs to help people in the rural areas to start businesses and manage their businesses effectively.

4.8.2 Digital Marketing and E-Commerce: ICT enables rural businesses to establish an online presence and reach a wider customer base through digital marketing and e-commerce platforms. Websites, social media and online marketplaces create opportunities for rural entrepreneurs to showcase their products and services, connect with potential customers and transact online, thereby opening wider their reach across local borders.

4.8.3 Access to Market Information: The IT platform can provide rural entrepreneurs with real-time market information, including consumption trends, price data and market demand. Online portals, mobile applications and SMS services provide valuable market information, allowing rural businesses to make informed decisions about product offerings, pricing strategies and market positioning.

4.8.4 Supply Chain Management: IT tools can streamline supply chain management for rural entrepreneurs. Online inventory management systems, digital tracking platforms, and logistics applications facilitate efficient sourcing, storage, and distribution of goods. This helps improve the competitiveness of rural businesses by optimizing operations and reducing costs.

4.8.5 Access to Financial Resources: ICT can link rural entrepreneurs with financial institutions and other sources of finance. Online lending apps, crowd funding platforms, and peer-to-peer lending networks enable rural businesses to access capital to cover startup costs, working capital, and expansion plans. Digital platforms also simplify the process of storing and reporting financial records, thereby improving businesses' creditworthiness and access to formal financial services.

4.8.6 Business Connection and Cooperation : The IT platform promotes connection and collaboration among rural entrepreneurs. Online forums, social media groups and digital communities bring like-minded people together, allowing for knowledge sharing, collaboration on projects and outreach initiatives. Rural entrepreneurs can learn from each other, share experiences and explore potential partnerships.

4.9 COMMUNITY DEVELOPMENT AND SOCIAL SERVICES

ICT can be used to facilitate community development and social service delivery in rural areas. ICT platforms can be used to enable community members to be involved in decision-making and voice their concerns, as well as to facilitate community development activities. Additionally, ICT tools can be used to share information, resources and best practices between community members, local organizations and government agencies.

This can be done through websites, community portals and mobile apps, which can provide access to essential information such as health services, education programs, government schemes and community events. This can help to ensure that rural communities' needs and priorities are taken into account when developing initiatives.

4.9.1 Social Welfare Programs: ICT tools can streamline the delivery of social welfare programs and benefits to rural communities. Online registration systems, digital databases, and mobile applications simplify the application process, eligibility verification, and disbursement of social assistance. This reduces administrative burdens, minimizes delays, and ensures timely support for vulnerable populations.

4.9.2 Education and Skill Development: ICT platforms support educational initiatives and skill development programs in rural communities. Online learning platforms, educational apps, and digital libraries provide access to educational resources, online courses, and interactive learning materials. Virtual training programs enhance skill development and vocational training opportunities, empowering individuals to improve their livelihoods.

4.9.3 Disaster Management and Emergency Services: ICT supports disaster management and emergency response systems in rural communities. It is possible to disseminate early warning information, provide emergency contact information; coordinate relief efforts in cases of natural disasters or other emergencies through mobile applications, SMS based alerts and mapping tools. In times of crisis, information and communications technologies are facilitating efficient communication and mobilisation of resources.

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CHAPTER – 05

TELECOM SECTOR & ICT : THE DIGITAL FABRIC FOR RURAL INDIA***DR GOVIND SINGH¹, PROF JITENDRA SINGH BHADAURIA² & PROF KAMAL SETHI³****¹Faculty of Engg & Tech, MGCG Vishwavidyalaya Chitrakoot, District - Satna [MP]**²Deptt of Agricultural Extension, KAPG College Pryagraj [UP]**³Deptt of Comp Sc. & Engg., Acropolis Institute of Technology & Research, Indore [MP]***5.1 INTRODUCTION**

Telecom sector plays a vital role in developing the rural area in various sector, it has helped to develop the rural sector in tremendous way. It is used in rural area for the growth of various field like education, agriculture, medical treatment and many other. ICT is enabling citizens' participation and streamlining the work processes of government to improve the quality of services and responsiveness towards citizens. It enables citizens to use information as a key resource for betterment of their lives and strive towards socio-economic development. Telecom sector is playing a decisive role in bringing about economic development across different geographic locations in India. They can enhance rural productivity by enabling solution-sharing between the local people and communities.

ICT is helping to provide access to practical information on small business bookkeeping, weather forecast, and best practices in farming. Properly developed communications networks can help farmers and agriculturists gain timely access to market information so that they can make appropriate decisions about the crops to be planted, where to sell the produce and buy the required inputs. ICTs also make rural finance service easily accessible. Such financial and information service networks can offer microfinance opportunities to local people, communities and small enterprises that could not access flexible financing earlier because of rigid banking rules, information monopolisation by the government and large-sized businesses.

Telecom and ICTs sectors help to improve business process efficiency and raise productivity. Using these technologies, businesses can effectively cut down on the operational costs by reducing material, procurement and transaction costs that lead to lesser prices for intermediate and finished goods as well as use better information to improve the value of their output. For instance, Telecom and ICTs technology provide an e-trading platform to utilities companies that simplify the procurement processes for both sellers and buyers, thus

lowering the costs for them. Communications technology can facilitate global connectivity. This will help design novel ways of creating and delivering products on a global scale. ICT-created business models and market configurations such as value chain integration, disintermediation and business process outsourcing enable developing countries to access new markets and gain competitive edge to drive income growth. Telecommunication and information technology have revolutionized the way we communicate and operate in today's world. With the rise of telecommunication, people can now connect with each other in real-time, no matter where they are in the world. India is the fastest-growing telecom advertising market, with an annual growth rate of 11% between 2020 and 2023. The Indian telecom companies, with the help of this, can expand their network and set up towers which will bring more subscribers and generate employment. The global Telecom Tower market reached a value of USD 44998.04 million in 2022. It's expected that the market will achieve USD 57398.29 million by 2028, exhibiting a CAGR of 4.14% during the forecast period.

There's a dramatic acceleration currently under way. Network-connected device types are multiplying, bringing important implications for the ecosystem of wired and wireless technologies, products, and services all providing a foundation for tomorrow's digital economy. Customer dissatisfaction, inflexibility, and slow adoption of new technologies are common issues plaguing telecom companies worldwide. But here's the secret: the most successful telcom are the ones that quickly adapt their internal processes and embrace new tech solutions to overcome those pain points.

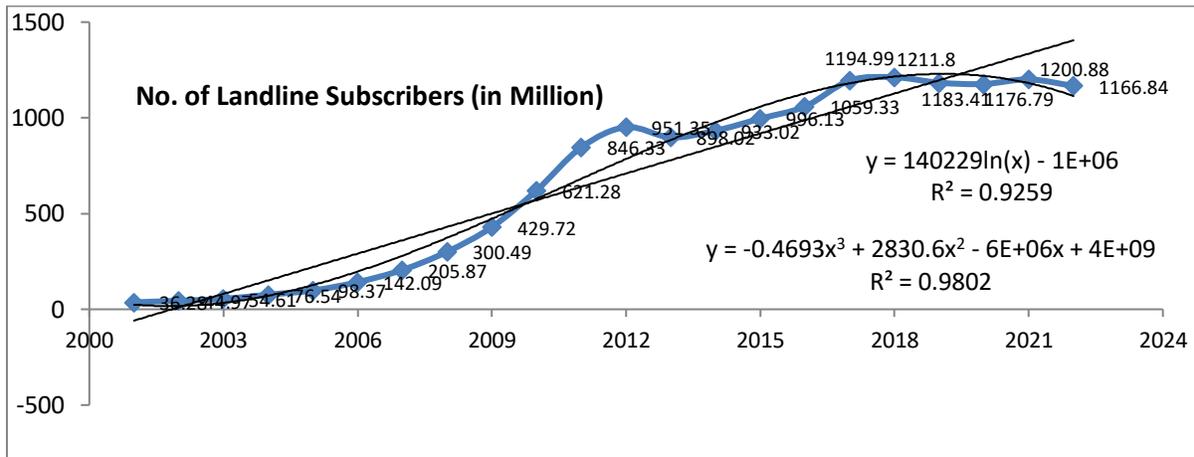
5.2 CURRENT STATUS OF TELECOM SECTOR INDIA

Telecom sector has a multiplier impact on the economy and in India, it is going through a booming phase playing an important role in economic growth and social transition of the country. Internet and broadband penetration in the country is increasing steadily, boosting the Government's Digital India campaign and recently India has joined the race in 5G. India is currently the world's 2nd-largest telecommunications market with a subscriber base of more than 1.20 billion and has registered strong growth in the past decade and a half. India is on its way to becoming the 2nd-largest smartphone market globally by 2025. The total subscriber base, wireless subscriptions as well as wired broadband subscriptions have grown consistently. Tele-density stood at 84.51%, as of March 2023, total broadband subscriptions grew to 846.57 million until March 2023.

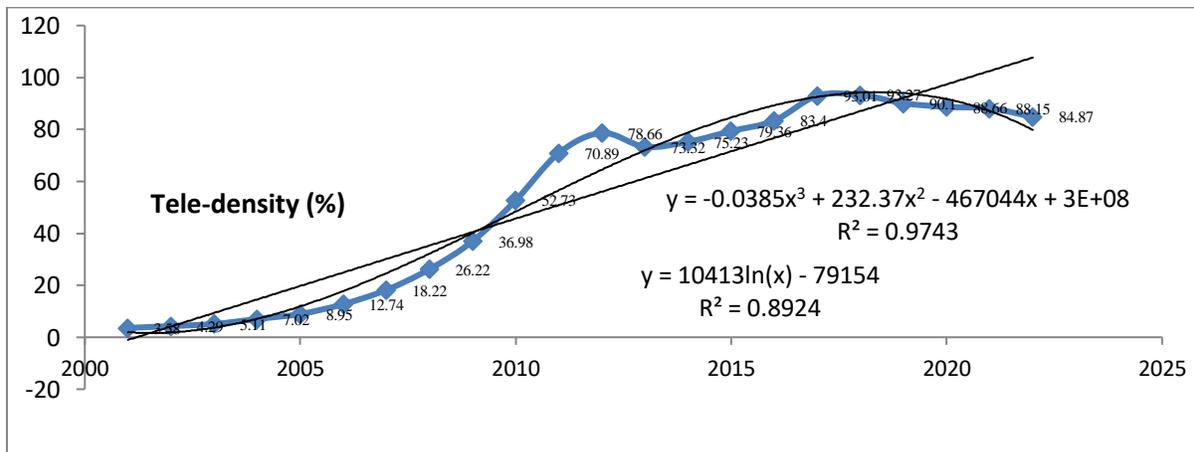
The aggregated data consumed as on 31st December 2022 was 14,024,519 GB. The total wireless data usage in India grew at a rate of 0.96% from 40,126 PB in September 2022 to 40,512 PB in December 2022. The contribution of 2G, 3G and 4G data usage to the total

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volume of wireless data usage was at 0.14%, 0.93% and 98.93%. As per TRAI, average wireless data usage per wireless data subscriber was 17.11 GB per month in December 2022 from 61.66 MB in March 2014. The total number of internet subscribers reached 865.90 million in October-December 2022. The wireless segment accounted for 96.25% (i.e. 833.49 million) of the total telephone subscriptions In December 2022. Over the next five years, rise in mobile-phone penetration and decline in data costs will add 500 million new internet users in India, creating opportunities for new businesses.



General Gaussian Model $f(x) = a1 \cdot \exp(-((x-b1)/c1)^2)$, where $a1 = 1233$ (1169, 1297), $b1 = 2019$ (2018, 2020), $c1 = 9.696$ (8.5, 10.89) with 95% confidence bounds, Goodness of fit – SSE : 1.256e+05, R-square : 0.973, Adjusted R-square: 0.9701, RMSE : 81.31



General Gaussian Model $f(x) = a1 \cdot \exp(-((x-b1)/c1)^2)$, where $a1 = 94.57$ (89.32, 99.81), $b1 = 2018$ (2017, 2019), $c1 = 9.496$ (8.351, 10.64) with 95% confidence bounds, Goodness of fit – SSE : 850.9, R-square : 0.968, Adjusted R-square : 0.9646, RMSE : 6.692

Table 5.1 : Rural, Urban, Public and Private Telephone Subscribers in India(in Million)

At the end of March	Total	Wireline	Wireless	Rural	Urban	Public	Private
2006	142.09	40.22	101.87	18.54	123.55	61.08	81.01
2007	205.85	40.77	165.08	47.10	158.76	71.39	134.47
2008	300.49	39.41	261.08	76.50	223.99	79.55	220.94
2009	429.73	37.96	391.76	123.51	306.21	89.55	340.18
2010	621.28	36.96	584.32	200.77	420.51	105.87	515.41
2011	846.33	34.73	811.60	282.29	564.04	126.00	720.33
2012	951.35	32.17	919.17	330.83	620.52	130.27	821.08
2013	898.02	30.21	867.81	349.21	548.80	130.11	767.91
2014	933.02	28.50	904.52	377.78	555.23	120.05	812.96
2015	996.13	26.59	969.54	416.08	580.05	100.34	895.79
2016	1059.33	25.22	1034.11	447.77	611.56	108.65	950.68
2017	1194.99	24.40	1170.59	501.81	693.18	122.18	1072.81
2018	1211.80	22.81	1188.99	525.87	685.93	131.66	1080.14
2019	1183.41	21.70	1161.71	514.27	669.14	133.51	1049.90
2020	1176.79	19.13	1157.67	521.26	655.54	134.97	1041.82
2021	1200.88	20.24	1180.64	537.11	663.76	131.16	1069.72
2022	1166.84	24.82	1142.02	519.63	647.21	127.10	1039.74

India is on the brink of the 5G revolution. As India is gearing up for commercial launches, Latest analysis reveals that a large addressable market already exists for India's operators because a sizable proportion of smartphone users already use 5G-capable smartphones. Therefore, there is a massive opportunity for the mobile operators to quickly gain 5G customers by rolling out 5G services in places with higher proportions of users that already own 5G-capable smartphones. In August 2022, India concluded its long-awaited 5G spectrum auctions, generating \$19 billion from the sale of frequencies in the 700 MHz, 800 MHz, 1800 MHz, 2100 MHz, 3.5 GHz and 26 GHz bands. Jio and Airtel walked away with most of the spectrum, while Vodafone Idea (VI) pursued a slightly different strategy, purchasing frequencies worth \$2.4 billion but only in selected markets. Almost immediately after this, the Department of Telecommunications (DoT) issued spectrum assignment letters, requesting mobile operators prepare for the launch of 5G services in the country. Prime Minister Narendra Modi inaugurated 5G services. Airtel is the first to launch commercial 5G services. The operator has switched on 5G in eight cities Delhi, Mumbai, Varanasi, Bangalore, Chennai, Hyderabad, Nagpur and Siliguri and aims to make it available across the country by

March 2024. While Airtel announced implementing 5G non-standalone access (NSA) technology, by contrast, Jio has taken the 5G standalone access (SA) route, using the 700 MHz (5G low-band spectrum) that no other Indian operator currently has. Jio plans to switch on its 5G services by Diwali (October 2023) and launch its own-branded 5G phone around the same time. On the other hand, Vodafone-Idea (VI) is yet to announce its 5G launch timelines. By 2025, India will need ~22 million skilled workers in 5G-centric technologies such as Internet of Things (IoT), Artificial Intelligence (AI), robotics and cloud computing. Total broadband subscriptions in the country grew from 149.75 million in Financial Year 2016 to 846.57 million in Financial Year 2023 (April-March). The number of wired broadband subscriptions stood at 33.49 million in Financial Year 2023 (Until March 2023). Wireless broadband subscribers stood at 813.08 million in Financial Year 2023.

As of March 2023, the top 5 service providers (Reliance Jio Infocom Ltd stood at 438.56 million, followed by Bharti Airtel (241.90 million), Vodafone Idea (124.83 million), BSNL 25.37 million and Atria Convergence 2.14 million. Open signal assessed the mobile network experience of the four main mobile network operators in India: Airtel, BSNL, Jio and Vodafone-India (VI), over a period of 90 days starting on June 1, 2022, and ending on August 29, 2022, to understand how they compare nationally as well as in 22 telecom circles. Yet there are still gaps, such as high right-of-way costs, low-rural penetration of modern telecom infrastructure, data privacy, and mismanagement of e-waste. Therefore, a stringent legal framework governing telecommunication in India is essential.

5.3 GOVERNMENT INITIATIVES

The Government has fast-tracked reforms in the telecom sector and continues to be proactive in providing room for growth for telecom companies. The Government is implementing the flagship BharatNet project (in phases), to link each of the 2.5 lakh Gram Panchayats of India through optical fibre network. This is the largest rural connectivity project of its kind in the world. Up to July 2022, 5,84,747 km length of Open Fiber Control (OFC) is laid connecting 1, 87,245 Gram Panchayats. In 1,81,888 Gram Panchayats the service is ready on fiber and satellite. In Union Budget 2023-24, the Department of Telecommunications was allocated Rs. 97,579.05 crore (US\$ 11.92 billion). Of this, US\$ 48.88 million (Rs. 400 crore) is for Research and Development; US\$ 611.1 million (Rs. 5,000 crore) is for Bharatnet. BharatNet Project Scheme, Telecom Development Plan, Aspirational District Scheme, initiatives in North-Eastern Region through Comprehensive Telecom Development Plan (CTDP), etc. resulted in a 200% increase in rural internet subscriptions between 2015 to 2021. To drive the development of 6G technology, the Department of Telecommunications

(DoT) has developed a sixth generation (6G) innovation group. The Government of India has expressed plans to expand the definition of "telecommunication services" by including Over-the-top (OTT) communication services under the same umbrella, which means that internet-based communications and OTT would both require a licence to offer services. The plan also lays down provisions for unutilised spectrum to be shared, traded, leased, surrendered, returned, or surrendered.

Table 5.2 : Internet Subscribers in India (in Million)

At the end of March	Total	Narrowband	Broadband	Wired	Wireless	Urban	Rural
2007	-	-	2.34	9.27	31.30	-	-
2008	-	-	3.87	11.09	65.50	-	-
2009	-	-	6.22	13.54	117.82	-	-
2010	-	7.41	8.77	16.18	177.87	-	-
2011	-	7.79	11.89	19.68	381.40	-	-
2012	-	5.70	13.81	19.51	-	-	-
2013	-	6.56	15.05	21.61	143.20	-	-
2014	251.59	190.72	60.87	18.50	233.09	-	-
2015	302.36	203.15	99.20	19.07	283.29	194.80	107.56
2016	342.65	192.90	149.75	20.44	322.21	230.71	111.94
2017	422.20	145.68	276.52	21.58	400.62	285.68	136.52
2018	493.96	81.35	412.60	21.24	472.72	348.13	145.83
2019	636.73	73.42	563.31	21.68	615.05	409.72	227.01
2020	743.19	55.75	687.44	22.42	720.77	457.22	285.97
2021	825.30	47.21	778.09	26.00	799.31	502.53	322.77
2022	824.89	36.59	788.30	27.27	797.62	493.08	331.81

The Government of India intends to establish one hundred labs for creating applications using 5G services in engineering universities as part of the Union Budget 2023, in order to realize a new range of possibilities, business models, and job potential. As of March 2023, the PLI scheme for Large-Scale Electronics Manufacturing (LSEM) has attracted investment of US\$ 726.77 million (Rs. 5,998 crore) and led to a total production of US\$ 33.55 billion (Rs. 276,903 crore), including exports of US\$ 15.61 billion (Rs. 1,28,886 crore). RailTel, a mini Ratna PSU launched Prime Minister Wi-Fi Access Network Interface (PM-WANI) to access its Public WiFi services across 100 railway stations having 2,384 WiFi hotspots in 22 states. Universal Service Obligation Fund (USOF) officially launched Telecom Technology Development Fund (TTDF) Scheme on October 01st, 2022. The government plans to update extant regulatory framework with the Indian Telecommunication Bill, 2022

On December 2022, 42 companies have committed an investment US\$ 502.95 million (Rs. 4,115 crore) comprising 28 MSMEs and 14 Non-MSMEs (eight domestic and seven global companies) have been approved under the Production-linked Incentive (PLI) Scheme. In August 2021, the Department of Telecommunications (DoT) initiated discussions with banks to address financial stress in the telecom sector, particularly Vodafone Idea Ltd. (VIL) that urgently requires fund infusion to stay afloat. FDI cap in the telecom sector has been increased to 100% from 74%; out of 100%. In October 2021, the government notified 100% foreign direct investment (FDI) via the automatic route from previous 49% in the telecommunications sector. FDI of up to 100% is permitted for infrastructure providers offering dark fibre, electronic mail and voice mail.

The achievement of the Government in the past four years is the department of Telecommunication launched 'Tarang Sanchar', a web portal sharing information on mobile towers and EMF Emission Compliances. Payments on unified payments interface (UPI) hit an all-time high of 3.65 billion (by volume), with transactions worth ~Rs. 6.54 trillion (US\$ 87.11 billion) in September 2021. Over 75% increase in internet coverage from 251 million users to 446 million.

5.4 REFORMS-DRIVEN PROGRESS FOR INDIAN TELECOM

The telecom sector has proven to be the backbone of the country during the pandemic. To remain connected with the world, Internet has become an indispensable need in the modern era. India is one of the biggest consumers of data worldwide making it world's second-largest telecommunications market with a vast subscriber base of 1.17 billion, second only to China. With the second largest mobile network base with 1170.45 million active subscribers and 821.49 broadband connections (TRAI, October 2022), it becomes all the more necessary to build a robust network that reaches the far-flung corners of the country. The telecom sector in India has witnessed some major developments in the year 2022, which establishes it as a catalyst for the Indian economy going ahead. The deployment of the nation's telecom infrastructure has been greatly expedited and made easier by the Wireless Licensing Reforms of 2022 and the Indian Telegraph Right of Way (Amendment) Rules, both of which came into effect in 2022. The licensing reforms reduced the processing fee from INR 1,000 to INR 100 and expedited the process for obtaining the (SACFA) certificate clearance, which is necessary to place small cells on street furniture. The RoW Amendment Rules made provisions to address obstacles caused by the lack of access to sufficient street furniture for deployment and restrictions on installing towers or small cells close to educational institutions, hospitals, airports, defence establishments, etc.

Moreover, the new fee changes INR 1,000 per KM for aerial OFC, INR 300 per year for urban regions, INR 150 per year for rural areas and INR 1,000 per pole for the construction of poles for small cells installation are big positives for the sector. Additionally, TRAI has suggested that fees paid by one TSP to another for the sharing of infrastructure be permitted as a deduction from Gross Revenue for the purpose of levies of Licence Fees. This will encourage infrastructure development and sharing. The government's introduction of digitization process on a number of fronts is making it easier to do business in India. For instance, the GatiShakti Sanchar Portal's introduction of the 5G RoW application form established a cooperative institutional mechanism between all parties, including the Central and State/UT government(s), to facilitate Right of Way (RoW) applications and permissions for the deployment of the country's digital infrastructure, including mobile towers and OFC.

Also, the process for obtaining an import licence has been moved online, and self-declaration-based clearance has replaced former scrutiny-based clearance. This will facilitate equipment deployment across the nation more quickly. Similar procedures have been introduced to streamline the process of obtaining technical approval for telecom towers from the DoT. The time taken to deliver services has been drastically reduced as a result of the digitization of records and the automatic renewal of licences. Through the Saral Sanchar portal, the entire licencing process has been made online, which has reduced the turnaround time from an earlier average of one year to just two months.

The reformative draft Indian Telecommunication Bill, 2022, seeks to address a number of issues faced by the sector over the years. With the aim of enabling regulatory certainty, ensuring a level playing field, and applying the law prospectively, the government has chosen several good elements and included them in the draft bill. The requirements for effective use of spectrum, license framework, dispute resolution and graded penalties will increase the efficacy of the law. The draft bill also emphasizes measures pertaining to spectrum, such as refarming and harmonisation, sharing, trading, leasing, technology agnostic use, returning unused spectrum to the government, surrender of spectrum, etc., that will aid in the sensible management of the national resource.

5.5 TELECOM

Information and Communication Technologies (ICTs) play a central role in the development and economic growth of rural India. A lot depends on the ability to access, collect, analyze and use the information and knowledge. ICT acts as the conduit for this purpose so that the appropriate information can be transmitted to individuals in the rural areas. A successful and detailed ICT application in e-Governance that provides aggregated solutions for the rural

community is the need of the hour and ICT has been crafted to enable electronic governance through wireless communication.

India is predominantly a rural country with two-third population and 70% workforce residing in rural areas. Rural economy constitutes nearly 50% of the National Income. Thus, the rural population's sustained growth and development is critical to the overall growth and inclusive development. Those living in rural areas deserve better living standards for sanitation, housing, piped drinking water, and electricity. Better education, health facilities, skills, jobs, and consumption are considered equally crucial by an archetypal Indian rural household. This scenario holds true in many of the Asian countries with significant rural population such as Sri Lanka, Nepal, Cambodia, Myanmar, Bangladesh, Thailand, Indonesia, and other parts of the world such as Latin America and Africa. The migration from rural to urban is one of the side effects if the development is not equitably addressed.

To address these issues, the efforts are being done by respective Governments in terms of development initiatives, at individual and/or family and/ or community level, and duly supported by e-Governance measures. Although the progress and impact may vary from province to province, region to region and country to country. The digital-first emphasis brought to the forefront by the Digital India Programme has highlighted the opportunity to catalyse and energise the rural development initiatives. There are several ICT systems which were rolled out to support the Government Schemes and programmes catering to the rural areas. ICT infrastructure was strengthened through rollout of digital connectivity and setting up of Telecentres in villages through which ICT applications would provide services.

5.6 ICT IN AGRICULTURE & NATIONAL E-GOVERNANCE PLAN (NGEP)

Agriculture is rightfully considered the backbone of Indian rural economy. To improve and sustain the overall prosperity, National e-Governance Plan (NGEP) has been given effect to lay the foundation for various projects at the grass-roots level that would provide impetus for long-term e-governance in the country. And to achieve this, there needs to be a proper framework. The success of ICT in rural areas will require many changes to the current landscape (e.g. increased availability of education, training, infrastructure, and affordable ICT capital). The regression analysis shows that ICT can help decrease rural poverty, given it is better dispersed among the populations. In India, in both sub-groups of ICTPS, i.e., in secondary and services sectors, rising ICT intensity is followed by increased employment growth. At the local level, e-governance and the appropriate use of ICT can enhance and support economic and social development, particularly in empowering officials and municipal representatives, ensuring linkages, networking, timely, efficient, transparent and

accountable services. In this context it is pertinent to assess the impact of the rural e-Governance initiatives and gather evidence to realistically analyse its success and breaches. Quite a few e-Governance assessment frameworks have been developed by various entities to measure the readiness and impact. The frameworks are (a) UN E-Government Development Index (b) EU E-Government Benchmark (c) the Waseda IAC International Digital Government Ranking, (d) OECD Digital Government Transformation. In India, National e-Governance Service Delivery Assessment (NeSDA) initiative has been undertaken by Department of Administrative Reforms & Public Grievances (DAPRG), Government of India.

This framework primarily assesses all the service portals for State/ UT and Central Ministry on 7 key parameters, viz. Accessibility, Content Availability, Ease of Use, Information Security & Privacy, End-service Delivery, Integrated Service Delivery and Status & Request Tracking. In NeSDA 2021, the framework is proposed to include additional 6 parameters, viz., Open Government Data, E-Participation, Alignment to IndEA (India Enterprise Architecture), Alignment to SDG (UN's Sustainability Development Goals), Leveraging Emerging Technologies, and Cyber Resilience.

5.7 ICT IN AGRICULTURE & E-CHOUPAL

'e-Choupal' launched in June 2000, has already become the largest initiative among all Internet-based interventions in rural India. 'e-Choupal' services today reach out to over 4 million farmers growing a range of crops - soyabean, coffee, wheat, rice, pulses, shrimp - in over 35000 villages through 6100 kiosks across 10 states (Madhya Pradesh, Haryana, Uttarakhand, Uttar Pradesh, Rajasthan, Karnataka, Kerala, Maharashtra, Andhra Pradesh and Tamil Nadu). The problems encountered while setting up and managing these 'e-Choupals' are primarily of infrastructural inadequacies, including power supply, telecom connectivity and bandwidth, apart from the challenge of imparting skills to the first time internet users in remote and inaccessible areas of rural India.

Several alternative and innovative solutions - some of them expensive - are being deployed to overcome these challenges e.g. Power back-up through batteries charged by Solar panels, upgrading BSNL exchanges with RNS kits, installation of VSAT equipment, Mobile Choupals, local caching of static content on website to stream in the dynamic content more efficiently, 24x7 helpdesk etc. The roadmap includes plans to integrate bulk storage, handling & transportation facilities to improve logistics efficiencies. As India's 'kissan' Company, ITC has taken care to involve farmers in the designing and management of the entire 'e-Choupal' initiative. The active participation of farmers in this rural initiative has created a sense of ownership in the project among the farmers. They see the 'e-Choupal' as the new age

cooperative for all practical purposes. This enthusiastic response from farmers has encouraged ITC to plan for the extension of the 'e-Choupal' initiative to altogether 15 states across India over the next few years. On the anvil are plans to channelise other services related to micro-credit, health and education through the same 'e-Choupal' infrastructure.

'e-Choupal' also unshackles the potential of Indian farmer who has been trapped in a vicious cycle of low risk taking ability, low investment, low productivity, weak market orientation, low value addition, low margin and low risk taking ability. This made him and Indian agribusiness sector globally uncompetitive, despite rich & abundant natural resources. Such a market-led business model can enhance the competitiveness of Indian agriculture and trigger a virtuous cycle of higher productivity, higher incomes, and enlarged capacity for farmer risk management, larger investments and higher quality and productivity. 'e-Choupal' makes use of the physical transmission capabilities of current intermediaries - aggregation, logistics, counter-party risk and bridge financing -while disintermediating them from the chain of information flow and market signals.

With a judicious blend of click & mortar capabilities, village internet kiosks managed by farmers - called sanchalaks - themselves, enable the agricultural community access ready information in their local language on the weather & market prices, disseminate knowledge on scientific farm practices & risk management, facilitate the sale of farm inputs (now with embedded knowledge) and purchase farm produce from the farmers' doorsteps (decision making is now information-based). Real-time information and customised knowledge provided by 'e-Choupal' enhance the ability of farmers to take decisions and align their farm output with market demand and secure quality & productivity.

The aggregation of the demand for farm inputs from individual farmers gives them access to high quality inputs from established and reputed manufacturers at fair prices. As a direct marketing channel, virtually linked to the 'mandi' system for price discovery, 'e-Choupal' eliminates wasteful intermediation and multiple handling. Thereby it significantly reduces transaction costs.

'e-Choupal' ensures world-class quality in delivering all these goods & services through several product / service specific partnerships with the leaders in the respective fields, in addition to ITC's own expertise. While the farmers benefit through enhanced farm productivity and higher farm gate prices, ITC benefits from the lower net cost of procurement (despite offering better prices to the farmer) having eliminated costs in the supply chain that do not add value. Appreciating the imperative of intermediaries in the Indian context, 'e-Choupal' leverages Information Technology to virtually cluster all the value

chain participants, delivering the same benefits as vertical integration does in mature agricultural economies like the USA.

CHOUPAL PRADARSHAN KHET

Another path-breaking initiative - the 'Choupal Pradarshan Khet', brings the benefits of agricultural best practices to small and marginal farmers. Backed by intensive research and knowledge, this initiative provides Agri-extension services which are qualitatively superior and involves pro-active handholding of farmers to ensure productivity gains. The services are customized to meet local conditions, ensure timely availability of farm inputs including credit, and provide a cluster of farmer schools for capturing indigenous knowledge. This initiative, which has covered over 91,900 CPKs, has a multiplier impact and reaches out to around 11 Lakh farmers.

5.8 DIGITAL SERVICES AND EMPLOYMENT OPPORTUNITIES

The Information and Communication Technology (ICT) sector contributes over 13 % to the country's Gross Domestic Product (GDP) and India's digital economy generates about \$200 billion of economic value annually from business process management (IT-BPM), e-commerce, domestic electronics manufacturing, digital payments, digital communication services (including telecom), etc. By 2025, India is expected to have an overall digital economy of about \$800 billion. According to KPMG, the market size of the India's ICT industry is currently estimated at \$180 billion and projected to grow to \$350 billion by 2025. The market breakdown by category is: IT services (52 %), ITeS BPM (19 %), Engineering and R&D Software (20%) and Hardware (9%). Major ICT centers in India include: Bengaluru (formerly Bangalore) also known as the Silicon Valley of India, Hyderabad, and Chennai in South India; New Delhi and Gurugram (formerly Gurgaon) located outside of New Delhi in North India; and Mumbai and Pune in West India.

Information and communications technology can contribute to better job opportunities in villages and rural areas both through improved labour market and direct employment. Electronic job marketplaces can help employers and employees match labour skills and availability so as to fill in the demand gap. TARA haat, is a portal that has been designed to cater to villages in rural India and provides job vacancy information on the local websites in regional languages. In addition, telecentres function as a job portal to provide direct employment to local women and men. The rural ICT applications offer services of central agencies like cooperative unions and district administration to the village people at their doorsteps. The improved and affordable connectivity via these apps can further be leveraged

to create appropriate job opportunities in rural areas to lead them on the path to economic progress.

Digital technology can create 360,000 jobs for rural communities till 2025 and grow rural business revenue by more than 21% during that time. This success demands more mobile communication access to help rural businesses. In 2021, the overall employment opportunities in telecom are expected to grow by 20% in India. The demand for contractual staffing is also on the rise. The profiles in demand are corporate sales, in-store executives, installation engineers, network engineers and wiremen. The temporary staffing hiring in telecom has almost doubled since 2019. Over the years, the telecom industry has created millions of jobs in India. The sector contributes around 6.5% to the country's GDP and has given employment to more than four million jobs. The primary revenue earner for the network is the cable TV services. With household penetration of TVs estimated at over 25% (with 25 million TVs) in the rural segment, this is likely to be a fairly strong and stable revenue earner in most of the larger villages.

However the penetration of cable TV services in this district, that is the state capital, may not be replicable entirely in the more remote /smaller rural markets. Although the network is planned to support 400 village kiosks, less than 120 kiosks are currently operational and about 30 to 40 kiosks have been shutdown for various administrative/business problems. Most of the kiosks are currently unviable with revenues ranging from Rs 4000 per kiosk per month to Rs 10,000 per kiosk per month. Compared to the capital cost of over Rs 200 million (USD 4.3 Million) and the operating costs in excess of Rs 2.1 million (USD 45650) per month, the business is not viable in its current form.

India is a young nation with 63% of its population under the age of 35 years. It has a fast growing digital audience with 800 million mobile connections and over 200 million internet users. The numbers of Mobile Base Transceiver Stations (BTS) are 23.98 lakhs. The numbers of mobile towers are 7.4 lakh. Many lakhs worker, employee and security guards are required for operation and maintenance. Job openings in the telecom sector are expected to double in the ongoing fiscal year to 38,000 as the Covid-19 pandemic loses potency and as operators prepare for 5G service rollouts. The Telecom Sector Skill Council (TSSC) said in a report that there was a combined demand of over 150,000 positions in 5G, Cloud Computing, AI & Big Data Analytics, IoT, Mobile App-Development and Robotic Process Automation, with a demand supply gap of almost 28%. Telecom sector witnessed average hiring growth of 13% in financial year 2020 whereas a dip of 1% was marked in financial year 2021 followed by a huge jump of 29% in financial year 2022. As the telecom companies are

looking forward to accepting the latest and fastest 5G technology, there are a number of job postings in the telecommunications sector for 5G which has increased its hiring by 38%. The industry is one of the top five job creators in the country. The telecom sector employs approximately 4 million people, with 2.2 million working directly and 1.8 million working indirectly. In 2021, the overall employment opportunities in telecom are expected to grow by 20% in the country. The job postings for "Cyber Security" have grown 81% between August, 2019 to August, 2022. More than 70% of households spend around 3% of their total household earnings on their mobile per month and nearly 57% re-charge at least once a week. Only 25% of users subscribed to any additional service and if they did, it was for caller tunes/ring tones (94%). Sports, jokes, news and horoscope followed next at 8%, 6% and 2%, respectively. SMS is hardly used; less than 20% of users had used it for any activity.

5.9 THE DIGITAL INDIA INITIATIVE

India imported over \$2.2 billion in computer and electronic equipment from the U.S. in 2017. India is the fastest growing telecom market in the world with over 550 million internet connections and over 500 million smart phone users. The ICT market in India is estimated at \$180 billion and is projected to grow to \$350 billion by 2025. The ICT hardware market is estimated at \$20 billion. The ICT sector growth rate is over 9% per year and it contributes about 9% of India's GDP. The Digital India initiative aims to improve digital infrastructure and internet connectivity, and this and other major government initiatives will drive growth in the ICT sector and open opportunities for U.S. companies. In recent years, data protection and privacy has been a major concern in India. The Government has come up with various bills and guidelines for data privacy, protection and localization. The Government has introduced Information Technology Intermediary Guidelines Rules-2018, a draft Personal Data Protection Bill, draft E-Commerce Policy, National Digital Communication Policy, national policy on electronics and national policy on software products as it aims to develop the digital economy.

India is adopting digital technology rapidly with more than 207 million Indians coming online in the last five years. Smartphone penetration has increased manifold from 5.5 per 100 people in 2013 to 26.2 in 2018. Monthly mobile data consumption per user has increased by more than 54 times since mid-2016. Monthly fixed-line data consumption per user has reached to 18.3 GB in 2018 from 7.1 GB during 2014. India has the second largest consumer base with 1.2 billion mobile subscriptions and second largest internet subscriber base with 560 million internet subscription as of 2018. The Indian government has issued more than 1.2 billion Aadhaar unique digitally verifiable identities to Indians which is the largest

national rollout globally. Indian internet users recorded 12.3 billion app downloads in 2018. India now has more than 294 million active social media users and 200 million users active on instant-messaging services like WhatsApp.

India currently has approximately 1.5 million kilometers of optical fiber cable and less than a quarter of the towers are fiber-connected. India is working on one of the world's largest rural optic fiber roll-outs in the world with an aim to connect 600,000 of its villages to broadband via its flagship program 'BharatNet'. Despite infrastructure challenges, the cloud services market in India is growing rapidly. Cloud spending in India is currently estimated at over \$2.12 billion with a strong government push towards improved infrastructure and adoption of cloud services, expanding internet access through smartphones, and more domestic enterprises and end users moving towards new technologies like artificial intelligence (AI), IoT and blockchain. As India reviews various tax ramifications and possible complications of providing items via cloud, it is advisable for U.S. suppliers or service providers to consider consulting experts about tax issues, data localization, and compliance requirements in India.

5.10 DIGITAL TECHNOLOGY

The IoT market was approximately \$11.1 billion with 2 billion connected devices by 2022. Focus areas include agriculture, health, water quality, natural disasters, transportation, security, automobile, supply chain management, smart cities, automated metering and monitoring of utilities, waste management, and oil and gas. With business of all sizes and the government increasing their spending on ICT security, cyber security services (consulting, implementation, support and managed security services) is the fastest growing segment and expected to be a major opportunity in India. Spending on AI by Indian companies is expected to increase due to the rising influence of AI-based solutions across the verticals per industry sources. AI is expected to add \$1 trillion to India's economy by 2035.

India ranks third in the research on AI, after China and US. Robotics in industries is increasing rapidly in India. Use of robotic technologies is growing across many sectors such as manufacturing industries, pharmaceutical, packaging, atomic energy, space, metals, textiles, and the automotive sectors in India. The blockchain market is expected to grow at a CAGR of 58 % in the year 2018-24. The banking and finance sectors have seen the highest adoption. Other industries, such as healthcare, retail and logistics, are also rapidly accelerating adoption. Blockchain usage has also been tested in the areas of trade finance, cross-border payments, bill discounting, supply chain financing, and digital identity.

The cyber security market in India is expected to reach \$35 billion by 2023. India put forward a draft Personal Data Protection Bill in 2018. The public cloud market in India is expected to reach a value of nearly \$2 billion in the near future, which represents a growing pool of vulnerable information that can be misused. Industry 4.0 tools will become an increasing part of cyber security mechanisms, given their utility for detecting areas of vulnerability and possible breaches. An area of focus for cyber security measures also includes possible internal threats, enhanced security testing and the implementation of blockchain. The Indian healthcare services sector is another area where robotic technology has been increasingly adopted for critical surgeries and for rehabilitation.

IT healthcare sector in India is expected to see increased adoption of cloud-based solutions and remote diagnostics and telemedicine solutions. India digital health market is expected to grow at 35 % CAGR during 2019-25. India's telemedicine market, which has been growing at a CAGR of over 20 %, is expected to cross the \$32 million mark by 2020. The convergence of technological solutions with data analytics, cloud computing, telecommunications, and wireless technologies will improve accessibility. The cost of providing medical services has been rising steadily and with technological innovation it will enable scale and lower costs, driving up adoption. Digital health start-ups have gained traction with customers and investors.

5.11 FUTURE OPPORTUNITIES

The Indian e-commerce market is expected to reach \$150 billion by 2022. The e-tailing industry is expected to grow due to the rapid growth of online shoppers. Large appliances are one of the fastest growing categories in Indian e-tailing, with its gross merchandise value growing 100% in 2018. India's \$1 billion online grocery market is growing at approximately 71% CAGR to reach \$5 billion from 2017-2020. Tier-2 online shopper population is the growth driver for e-tailing growing 3 times faster than metro cities. Online mobility is expected to encompass larger than current 1-2% share of all public transport rides by 2020.

Digital payments in India are expected to reach \$1 trillion by end 2023. Digital payments have increased significantly after demonetization came into effect two years ago. National Electronic Funds Transfer (NEFT) transactions increased from \$141 billion in 2016 to \$2.57 Trillion in 2018. Innovation has been one of the biggest drivers for the growth of India's digital payments economy. India's real-time money transfer platform Immediate Payment Service (IMPS) has been rated the best global payments innovation by US-based research firm Fidelity National Information Services (FIS). With WhatsApp (with almost 200 million users) rolling out its payments feature which is currently available only in the India, a peer-

to-peer system based on UPI will trigger the digital payments revolution in India. The data center market in India is reach to \$7 billion by 2020 from \$4.5 billion in 2018 due to the growth of digitalization. Around 10 data center projects are currently under planning phase in India. India imports the hardware and electronics to support the growth of IT sector; 50-60 % of electronic products and 70-80 % of the components are imported. India's "Make in India" policy and other new policy initiatives aim to develop India's IT and electronics manufacturing industries.

India is the second-largest mobile manufacturer globally with a market size of \$22 billion and 268 manufacturing plants in the year 2018 and expected to grow 10 times of the market size by 2025. The top leading handset and wireless manufacturers in India are Samsung, Foxconn, Oppo, Vivo and Micromax. Mobile applications are one of the fastest growing markets, led by the growing popularity of over-the-top (OTT) application due to availability of low-range smartphones and increasing mobile connections. The market size is expected to grow with 20% CAGR to 37 billion app downloads per year by 2022. Augmented reality and virtual reality (AR/VR) technology is increasing the pace of adoption in India. The Indian AR/VR market is expected to register a CAGR of 76% from 2018 to 2023. Applications of AR/VR for headgear and mounted displays are on the rise. Retail, auto, healthcare, gaming and entertainment, defense and training sectors are at the forefront of AR/VR adoption in India. For the telecom sector, 4G is expected to peak by financial year 2021 and 5G rollout is expected in the next two years.

Due to availability of inexpensive handsets, the launch of voice services over long-term evolution (VoLTE) technology and expected use of 4G SIMs by next year is expected to peak the usage of 4G by financial year 2021. 5G rollout is making a progress and the government plans to auction 5G spectrum by end of the year. After the 5G rollout, the subscriber base for 5G is expected to reach approximately 38 % of total subscribers by financial year 2024. The telecommunications tower industry is expected to grow rapidly due to the expansion of 4G, 5G, Artificial Intelligence, Virtual Reality, Internet of things and M2M. The India Mobile Congress is the leading digital and telecommunications trade event in India and the region. The U.S. Commercial Service is collaborating with the IMC organizers to leverage this as a platform to assist U.S. companies.

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CHAPTER – 06

SUSTAINABILITY OF DAIRY IN SOCIO-ECONOMIC UPLIFTMENT

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6.1 INTRODUCTION

Indian economy is agriculture bases because more than 75% population lived in rural areas of village. A major farming community of India comes under small and marginal farming community, where the size of land holding is very low to achieve the standards of livelihood. India is a land of small farmers, with 650 million of its more than 1 billion people living on the land and 80 %farmers owning less than 2 ha of land. India, since over 700 million of India's population lives in villages and their principal source of livelihood is agriculture, comprising crop and animal husbandry, forestry, fisheries, agro-processing and agri-business. Therefore, accelerated progress in enhancing the productivity, profitability, stability, and sustainability of the major farming systems is the best safety net against hunger and poverty. Dairy cooperatives generate employment opportunity for some 12 million farm families. By placing technology and professional management in hand of village societies it has helped to raise the standards living of millions of people. According to the WHO more than 50% of child population is affected by the malnutrition.

Dairy products are major sources of cheap & nutritional food and it is acceptable source of animal protein for the Indian vegetarian segment, particularly among the landless, marginal, small farmers, women & children. Many new value addition activities have already been introduced by several schemes and projects in India offer indigenous and sustainable value added products with assured market without disturbing the ecological balance. India is number one milk producing country in the World. But not more than 15% of the total milk production is processed and converted to milk products including market milk in the organized sector. The process technology and advanced process equipments for milk powders, cheese, lactose, milk based beverages, and casein are available.

6.2 MILK AS A FOOD

Human milk contains about 10 times as much vitamin E and 2.5 times as much ascorbic acid as cow milk. In many countries milk is fortified with vitamins A and D. Vitamin A is central to the visual process as a constituent of the visual pigment rhodopsin. Vitamin D is essential for

the calcification processes in the body, including bone and teeth formation. Milk is also an excellent source of many minerals and supplies virtually all of the minerals required by humans. Cow milk furnishes a major portion of the total calcium consumed in many countries. The high levels of calcium and phosphorus in milk are important in bone and tooth formation in young children; both these elements play a significant role in preventing osteoporosis in elderly people. Milk also contains high levels of magnesium, zinc and iodine. However, milk is a poor source of iron and neither human nor cow milk supply enough for human infants. Fortunately, infants have a store of iron in the liver which is sufficient to meet the needs of the body during the first six months.

The nutritive value of milk may be considerably altered by processes such as separation, concentration of the components, addition of non-milk constituents and heat treatment. For example, during butter making the fat and fat-soluble vitamins are retained in the butter while the protein, lactose, minerals and B vitamins remain in the buttermilk. Part of the fat in butter can be replaced by vegetable oil to give better spread ability. Diluting cow milk with water or severe heat treatment greatly softens the casein curd and allows for easy digestion. When mother's milk is not available milk formulations for babies are prepared by mixing cow milk, cream, whey proteins, lactose and water. The ratio of casein to whey, protein, the lactose content and salts in milk formulations are similar to those of human milk. Mild heat treatment such as pasteurization or ultra high temperature (UHT) processing cause very little change in nutritive value. Severe heat treatment results in some loss of available lysine, but this has little effect on the nutritional quality because milk proteins are rich in lysine. Milk composition is affected by a number of factors including genetic and environmental factors. Both milk yield and composition vary considerably among breeds of dairy cattle.

6.3 CURRENT STATUS

The role of dairying for livelihood, food and nutrition security of millions of people in India is well recognized. One of the major breakthroughs in Indian Dairy Sector has been the White Revolution ensuring higher milk production, animal protein security and fight against malnutrition. Soon after independence, India accelerated the pace and emerged as the largest producer of milk in the world— touching 222 mt in 2022-23, and is expected to touch 628 mt by 2047 due to increasing demand for dairy products by the growing population, and increasing purchasing power and focus on nutrition. Presently, India produces 24 %of the total milk produced globally. The Indian dairy industry has grown at a remarkable pace and has the potential to ensure milk and dairy security for the world. Now, there is a need to

focus on breed improvement in mission mode to achieve the goal of increasing productivity to 10 litres instead of 2.5-3.0 litres per cattle today. The Indian dairy industry market is worth Rs 13 lakh crore, which is projected to be more than Rs 30 lakh crore by 2027.

In India, over 70 million households are directly dependent on dairying for their livelihood. Among them, 75 %are small and marginal producers with average herd size of 2-8 bovines. Dairying is considered a great support to farmers not only during normal but under adverse situations. Dairy farmers do get a steady income even in extreme conditions such as flood, drought and pandemics. During 2020-2022, despite COVID-19 pandemic, the Indian dairy sector was the least affected one and showed its resilience.

During 2018-19, the value of milk was more than the value of all foodgrains and pulses. This made milk as the largest economic commodity in Indian agriculture. Also, the dairy sector is growing at much faster rate as compared to other agricultural sub-sectors. The milk production increased from 17 mt during 1950- 51 to 222 mt in 2022-23. The growth rate of milk production globally is 1.3 per cent, whereas in Indian dairy sector, it had been around 6 %since 2014-15. It is forecasted that by 2028, the demand of milk in India would be around 246 mt, while the supply will be around 276 mt. The per capita milk availability in India is around 444 g, higher than the ICMR recommendation (280 g/person/day), which is higher as compared to the world per capita milk availability of 229 g/day. According to nutrition experts, a healthy person needs 380 ml of milk every day. Considering the spoilage, the per capita production should be around 420 ml per day.

India has crossed this important milestone in 2020-21 and the production is above the recommended level. We have to look for developing markets for our milk overseas and for that we need to focus on improving the quality of milk. It is the technological interventions which resulted in increase in the milk production (1,235.3% rise) and not the number of livestock (24 and 153% rise in cattle and buffalo population, respectively) from 1951 to 2019, depicting the glorious journey of Indian dairy sector.

Dairy is the single-largest agri-commodity in India. It contributes 5% to the national economy and employs 80 million dairy farmers directly. A revival in economic activities, increasing per capita consumption of milk and milk products, changing dietary preferences and rising urbanization in India, has driven the dairy industry to grow by 9-11% in 2021-22. The livestock sector has grown at a Compound Annual Growth Rate (CAGR) of 8.15% over the last five years ending 2020. Growth in the liquid milk segment, which accounts for over half of the dairy industry, is likely to remain stable (6-7%). The organized dairy segment, which

accounts for 26-30% of industry by value, has seen faster growth, compared to the unorganised segment.

6.4 PROCESSED PRODUCT OF MILK

Milk and milk products have been used by man since prehistoric times. Milk is processed primarily to convert it into a more stable product, e.g. fermented milk can be stored for about 20 days compared with less than one day for fresh milk. Milk products are more stable than fresh milk because they are more acidic and/or contain less moisture. Preservatives, e.g. salt may also be added to milk products. Thus, by increasing the acidity and reducing the moisture content, the storage stability of milk can be increased. Out of the total milk production, about 48% is consumed as fresh liquid milk and 52% of the surplus milk is transported to nonproduction areas, out of which 50% is handled by the unorganized sector, 20% by cooperatives and 30% by private organized sector. Only 5% of the total milk is used for value-addition in India, whereas, more than 90% of the total milk enters organized commercial channel in developed nations.

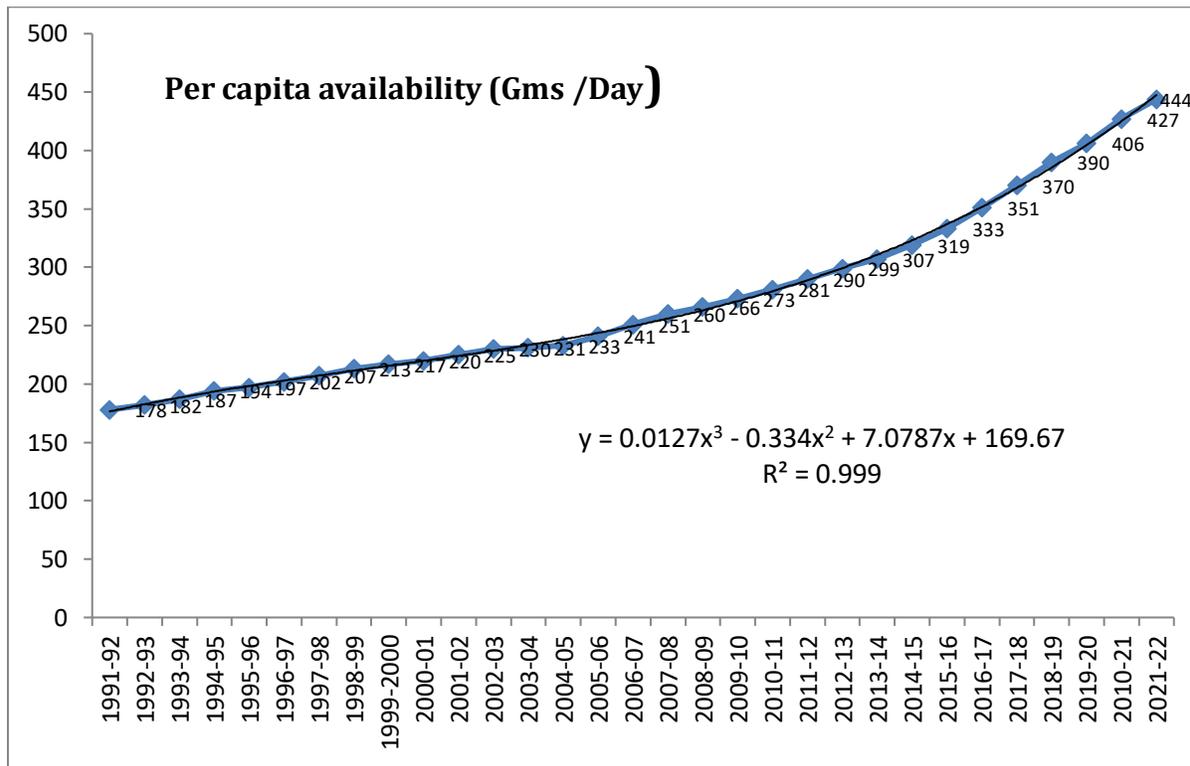


Figure : Per Capita Availability of Milk in India [Source : NDDDB, milk production in India]

Notably, milk output stands at more than 20.6% of the combined output of paddy, wheat, and pulses. India produces more than 100 million tons of milk per annum. Yet, her per capita milk consumption is around 250 gram/day. Due to increasing population, per capita availability of milk will increase by only about 1.5% per annum. For an economy growing at about 6% per annum, this increase in availability will be grossly inadequate. Production growing at only 3% and consumption growing at more than double the rate is obviously going to lead to a mismatch between demand and supply. This will create opportunities for international dairy companies. Total milk production in the country during 2021-22 is 221.06 million tonnes. In the current year 2021-22, the milk production has registered an annual growth rate of 5.29%. Top five major milk producing States are Rajasthan (15.05%), Uttar Pradesh (14.93%), Madhya Pradesh (8.06%), Gujarat (7.56%) and Andhra Pradesh (6.97%).

There are, at present, almost 2000 recognized varieties of cheese. Fermented milks have been prepared for more than 2000 years. Allowing milk to ferment naturally gives an acidic product that does not putrefy. Fermented milks are wholesome and readily digestible; examples of such products are yoghurt, *kefir*, *koumiss* and acidophilus milk. The development of the milk separator in the 19th century made centralized milk processing possible. Initially, cream was separated and retained for butter making and the fresh skim milk was returned to the milk producers. As the nutritional importance of the non-fat component (skim milk) became recognized, processes were developed to conserve milk solids-not-fat (SNF). Casein and casein products as well as lactose and dried milk were prepared. Today, up to 60% of the milk produced in the world is converted into dehydrated milk products and foods containing a large proportion of milk solids. India is the largest producer of milk accounting for more than 13% of world's total milk production. It is the world's largest consumer of dairy products, consuming almost 100% of its own milk production. Dairy products are a major source of cheap and nutritious food to millions of people in India and the only acceptable source of animal protein for large vegetarian segment of Indian population, particularly among the landless, small and marginal farmers and women. Dairying has been considered as one of the activities aimed at alleviating the poverty and unemployment especially in the rural areas in the rain-fed and drought-prone regions.

6.5 DAIRY SECTOR AND RURAL ENGAGEMENT

During the 1950s and 1960s, India was a milk deficit nation and was dependent mostly on imports. To overcome this problem, the Government set up NDDB in 1965 and requested Dr. Kurien to replicate the 'Anand pattern' dairy cooperative model throughout the country. In

1970, NDDDB launched a massive dairy development programme called 'Operation Flood (OF)' under Dr. Kurien's leadership to expand the dairy cooperatives network, build dairy infrastructure, and increase women's participation in dairy cooperatives. The OF programme transformed India from a milk deficit nation into a leading milk producer of the world. Owing to these efforts, in 1998, India became self-sufficient and surpassed the US in milk production, contributing 22 percent of global milk production in 2018. The dairy sector is one of the important sectors in the rural economy that enhances the economic condition of 80 million landless, small and marginal farm households in India. The sector also helps to reduce rural poverty, inequality, and ensuring nutrition to poor rural households. The livestock sector also contributes about 4.11% to India's GDP and 25.6% towards total agriculture GDP, whereas the dairy sector claims a major share by contributing 67 per cent to total livestock output (National Accounts Statistics, 2019).

Labour in India refers to employment in the economy of India. In 2020, there were around 476.67 million workers in India, the second largest after China. Out of which, agriculture industry consist of 41.19%, industry sector consist of 26.18% and service sector consist 32.33% of total labour force. Agriculture and allied activities provide the highest employment in the Indian economy. In India, Agriculture employs 50%-60% of the population. Agriculture is included in the primary sector. India's agriculture sector emerged as the leading industry in terms of employment in financial year 2023 with the number of employees tallying nearly 148 million. Dairy farming has been able to reduce rural poverty as it ensures constant income and provides security to the family members. This has reduced rural unemployment and underemployment, providing a sustainable livelihood for many individuals. Dairy farming has also been a key driver of rural development in India. It provides an additional source of income for farmers, which helps to reduce poverty and improve living standards. The dairy industry also supports the development of rural infrastructure, such as roads and electricity. Dairy farming has become a profitable enterprise for rural households.

6.6 DAIRY SECTOR AND RURAL UPLIFMENT

Dairy is a universal agricultural production: people milk dairy animals in almost every country across the world, and up to one billion people live on dairy farms. It is a vital part of the global food system and it plays a key role in the sustainability of rural areas in particular. Milk production serves as a regular source of income for farmers, enabling them to improve their standard of living. Selling of milk, dung, stock, milk products are the various sources of income from dairy farming. Farmers get around 50% of the income from dairying and

livestock. In villages, apart from labourers, farmers and landlords, there are also people who provide basic services. Barbers, nurses, village teachers, etc., are small professionals who are found in villages. Some of them are self-employed and some are employed under government schools or hospitals. 4.4 The income of dairy farmers from selling of milk to teashops, restaurants and households used to be as low as Rs. 35 per litre, mainly due to lack of proper marketing network

Around 70 million farmers are actively engaged in dairy farming, which contributes significantly to economic revenue. As the world's greatest population of livestock is found in India, it supports 14.7% of the world's cattle population and around 57.3% of its buffalo population. Dairy farming can be immensely profitable. However, you should know that you will require a significant amount of capital to start a dairy business. Moreover, you need some experience in this field to run this business successfully. India is the world's largest milk producer, with 22 percent of global production, followed by the United States of America, China, Pakistan and Brazil. The dairy industry in India was valued at INR 14,899.8 Billion in 2022. 2. What is the expected growth rate of the dairy industry in India during 2023-2028? We expect the dairy industry in India to exhibit a CAGR of 13.2% during 2023-2028.

In the dairy industry, an individual can set up their dairy farm revolving around milk production activities or work as a dairy farm manager. Other jobs that can be pursued in this sector are the roles of milkers, testers, stockmen, managers in cooperatives or vets. Dairy is the single-largest agri-commodity in India. It contributes 5% to the national economy and employs 80 million dairy farmers directly. The dairy industry contributes significantly to the country's economy and keeps food supply chains operational. Working in the dairy industry allows you to contribute to an important part of many people's daily lives. The objective of good dairy farming practice is the on-farm production of safe, quality milk from healthy animals under generally acceptable conditions.

6.7 CONCLUSION

Dairy sector provides self-employment opportunities, particularly for women and economically disadvantaged groups. Annually, 8.4 million small and marginal farmers depend on the dairy sector for livelihood, both directly and indirectly, out of which 71 per cent are women, thus demonstrating that the sector plays a vital role in women empowerment and inclusive growth. In developing countries, greater growth of the dairy sector can increase women's educational attainment and bridge the gap in gender inequalities. The dairy sector is thus a vital driver for helping India reach the SDGs enunciated in 2015 by the United Nations to transform the world and to protect the planet we live in. Further, keeping in mind

the nutritional value of milk, in the year 2018, an advisory was issued to all states to include milk in the Mid-day Meal Scheme and other nutritional programmes of anganwadis and in the ongoing schemes of health as well as Women and Child Development department to tackle malnourishment in the country. The Department of Food and Public Distribution was also requested to include milk in the PDS system. This is likely to increase milk consumption, which in turn will yield better returns for dairy farmers in the flush season.

India is self-sufficient in milk production, but only ten states in India produce 81 per cent of the total milk produced, and only nine states have achieved per capita availability of milk at par with the national level. The data shows that milk production in India is concentrated in a few states because of their robust dairy cooperative networks, and a higher remunerative price of milk received by the farmers in their respective states. In order to circumvent this, the Indian government needs to devise a suitable dairy development policy for enhancing milk production and procurement in the remaining potential districts and states. This implies that dairy promotion among small and landless farmers is critical to increasing milk availability, particularly in milk-deficit regions. It will also help expand the dairy sector and replicate the 'Anand pattern' throughout the country to enhance milk production and generate employment opportunities. Moreover, the recent government announcement for setting up a fund of Rs 15,000 crore for Animal Husbandry Infrastructure Development will help to promote private investments in the sector and the improvement of cattle feed infrastructure. Finally, this move will provide a boost to local manufacturing and consumption of locally produced goods and help further India's objective of achieving Atmanirbhar Bharat.

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CHAPTER – 07

HANDICRAFT : A SKILL INITIATIVE OF NEP

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7.1 INTRODUCTION

Rural entrepreneurship can be considered as the solution for unemployment, migration, economic disparity, reduces poverty, development of rural areas and backward regions. In India majority of population live in villages. Rural entrepreneurs may increase the standard of living and purchasing power of the rural people and bottom of pyramid by offering employment opportunity to the people in villages. Entrepreneurship is dominated by males, with two early-stage male entrepreneurs for every female entrepreneur. Generally speaking, men are still much more confident than women when it comes to skills and knowledge mastery for starting a business. Surprisingly, female startup rates grew faster than those for males, which showed a sign of the reversal of the general preconceptions of gender in entrepreneurship. Major goods exported by India are Handmade woolen, woodwares, embroidered & crocheted goods, art metal ware, hand printed textile & scarves, agarbatties & attars, zari & zari goods, and imitation jewellery. Karnataka is famous for its intricate sandalwood carving. Artisans carve exquisite designs on sandalwood, creating beautiful figurines, sculptures, and decorative items. Sandalwood carving requires precision and expertise, and the final products have a delicate fragrance

Handicraft means any craft which is handmade. It is an art where useful products are made using simple tools like scissors and other non-automated tools like hooks etc. It is a traditional main sector of craft making and applies to a wide range of creative and design activities that are related to making things with one's hands and skill, including work with textiles, moldable and rigid materials, paper, plant fibers, clay, etc. The oldest handicraft is dhokara assort of metal casting about 4000 years old. The art of handcrafting is deeply rooted in the lap of Indian history. The tradition goes back to 5,000 BC, when handmade crafts used to revolve around religion. Around 3,000 BC, during the Indus-Valley civilisation, several forms of arts and crafts originated, which can be found in museums today.

Handicraft has its roots in the rural crafts. Many crafts have been practised for century, while others are modern inventions or popularizations of crafts which were originally practiced in a limited geographic area. These products are produced within a specific community and

involve blue collar label. Banarasi sarees are among the finest sarees in India and are known for their gold and silver brocade or zari, fine silk and opulent embroidery. Weaving saris is a household tradition in rural South India. Tamil Nadu is famous for the Kanchipuram saris.

Handicraft involves a variety of products some of them to be listed are -

- Soap making
- Wood carving
- Basket weaving
- Flower decoration.
- Bandhani
- Batik art
- Pottery
- Hand bags
- Bagru art
- Toy making
- Lace making
- Leather work
- Crochet.
- Carpet making

Any many more art forms known all over the world especially in India.

7.2 INDIAN HANDICRAFT PORTAL

Indian handicraft portal is an initiative of government of India for digitization of handicraft products and to provide various services to artisans and other in an efficient and transparent manner. There are 2 schemes running on basically national handicraft development programme (NHDP) to provide livelihood to artisans and to improve product quality. And comprehensive handicrafts cluster development scheme (CHCDS) to build cluster of handicraft channels across the country.

7.3 NEP AND HANDICRAFT

NEP 2020 paves way to revive the dying arts of our country. It has also announced to employ rural artisans as guest faculty to impart education to students on various art forms. The National Research Foundation (NRF), envisioned in the NEP will not only focus on scientific research but will also be a catalyst in promoting quality research in art, music, philosophy, writing et al.

An initiative of Govt. of India to end to end digitization of the schemes for implementation and delivery of services to artisans and other stake holder The NEP also focuses on building

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new subjects like web designing, graphic design museum management archaeology etc. The policy also focuses on 'Ek Bharat Shrestha Bharat' programme to include touring of destinations around the country by students. Immense employment opportunities will be opened in teaching sector as well museum art galleries and heritage sites.

Art is a great way for students with disabilities to express themselves and gain confidence in their abilities. Students with disabilities can learn the art industry by learning how to draw and how to create their own art. The aims of art for students with disabilities are to understand their own emotions and feelings learn how to express themselves, experience social interaction and develop self-confidence by creating artwork from an emotional level. The scope of art for students with disabilities allows them to discover the skills that are most useful for them to fulfil their desired career.

CBSE has also launched a 12 hour module of handicraft from class 6 onwards. Art integration is inclusion of art to understand the concepts of other subjects as well , here art and craft is not taught as a separate subject it is merging of art forms with other subjects to make classroom teaching more joyful .The art forms prescribed by NEP 2020 include drawing & painting, paper crafts, puppetry, sculpting, photography, performing arts etc. Not just that, art-integration in classroom learning can also enable schools and teachers to go beyond the conventional subjects and focus on deeper learning like socio-emotional, cultural, mental health, and other areas. Art-integration can also be used to create inclusive classrooms where students can be sensitized towards opposite genders, differently abled peers and broader communities.



Learning through art is also beneficial because it has been proven through research that it can lead to longer retention and better attention from students. It also makes classroom learning a

collaborative experience for all the students through which they can also imbibe qualities like teamwork, empathy, coordination, cooperation, and communication. Art-integration also makes learning a very personal and meaningful experience for the student, which is essential for creating self-awareness.

Having talked about this, it is also important to highlight that being creative is a crucial need in today's work irrespective of which career option one chooses. If a child wants to make a career in arts, then art-integration can hone them and help in preparing them from an early stage. For those who want to pursue other career options, having a creative bent can help them in excelling in their respective fields as well.

It is anticipated that the NEP will not only reduce the social stigma associated with considering vocation as a career opportunity but will also provide students with promising career. The policy will play a vital role in equipping the manpower of the country with not only technical but also soft skills among graduate and post graduate students.

The talent-skill gap exists at various levels and is significant. It is affecting the employability scenario in almost every sector. As per the International Labour Organization, there will be a skill deficit of 29 million by 2030, which will significantly affect the country's GDP.

7.4 HANDICRAFT OF MADHYA PRADESH

Madhya Pradesh is the heart of India and a land of various handicrafts like bamboo work, metal work, Bagh printing, Bandhani, Comb art, Terracotta, Glass work etc.

- ❖ Madhya Pradesh is known for fascinating paintings of Bundelkhand, Gondwana, Nimar and Malwa these paintings provide expressions of daily life and are beautifully drawn on walls.
- ❖ Terracotta is an art of making beautiful and useful things for day to life. Wood craft is a tradition of many tribes of Madhya Pradesh, mainly the Baigas tribe of Madhya Pradesh carve figures and other things on furniture they also built houses with wood.
- ❖ Basket craft is done by the Toori tribe of Betul. They are known to make 50 different types of basket. The tribes of Alirajpur make beautiful furniture like table, chair, lamps from bamboo.
- ❖ Metalwork includes making figures and jewellery items like Bichua kardhona and other item with silver or bronze. Swankars of Tikamgarh specialize in metal art. They are known to make Thakurji out of metal. Tikamgarh is famed for chariots or brass horses with wheels.

- ❖ Iron work Kareras from Shivpuri are known for their iron work. They are known as lohars and cast iron metal into various forms like latches, bells, utensils etc.
- ❖ Paper mache the nagvanshi community of Madhya Pradesh make decorative articles with paper mache.
- ❖ Stone work various tribes of Madhya Pradesh are known for their stone work. Gwalior is known for their stone work and many stalls of Bedhaghat Jablpur are known to sell statues of stone the kari tribe of Tikamgarh sell many stone items and utensils made from stone.

7.5 MAJOR SHOPPING CENTRES FOR HANDICRAFT IN MADHYA PRADESH

Mirgnayani is the one the most famous handicraft shopping centre set up by Madhya Pradesh Hathkarga nigam and Madhya Pradesh Hastshilp. It showcase a number of master Craftskills to shop like terracotta, stone work, ornaments, metal work, Bagh and Bandhani printed Sarees etc.

Other then this Madhya Pradesh Vikas Nigam has set up many local shops all round the the state where one can by various exclusive pieces of handicraft of that particular region like handmade paper from Khadi gram Udhog, Batik and Bandhani print fabric from Indore, velvet purses from Bhopal, silver jewellery from also Bhopal. Stone work from Gwalior and marble work from Jabalpur.

Tribal jewellery from Tikamgarh and terracotta from Dhar is a very famous handicraft. Every once or twice a year Madhya Pradesh Hatkargha Nigam organise various types of craft bazaar in metro cities of Madhya Pradesh.

7.6 INDIAN INITIATIVES FOR HANDICRAFT

Handicraft is one of the largest employment generators in India after agriculture. India also exports its handicraft items last year the handicraft export from India was in millions. it is the backbone of rural economy from generations. **Various Government Schemes of The central government is actively working towards developing the industry to maximize its potential.**

For the development of the handicrafts sector, Government is implementing the National Handicraft Development Programme (NHDP) and the Comprehensive Handicrafts Cluster Development Scheme (CHCDS) for providing support on design, technology upgradation, infrastructure development, research and development, market support etc. to handicrafts clusters in the country. The introduction of several schemes and initiatives is helping craftsmen to overcome the challenges they face. Few platforms like Craftezy, have emerged

that lend the much-needed support to Indian artisans in finding visibility in domestic and global markets. These global handicraft trade **platforms come with a free supplier induction process and aim at giving it an organized image in the global market.** E-commerce has opened **doors to seamless access to consumer goods, and this has enabled inclusive growth** as all manufacturers in any part of the globe can showcase their products through these online platforms. Even social media platforms are helping immensely with marketing Indian handicrafts globally. Government has been implementing various policy initiatives and programmes for development of textiles and handicrafts particularly for technology upgradation, infrastructure creation and skill development.

❖ **Ambedkar Hastshilp Vikas Yojana**

- To support artisans with their infrastructure, technology and human resource development needs. The objective of **mobilising artisans into self-help groups and societies with the agenda of facilitating bulk production and economies in procurement** of raw materials.

❖ **Mega Cluster Scheme**

- The objective of this scheme includes **employment generation and improvement** in the standard of living of artisans.
- This programme **follows a cluster-based approach in scaling infrastructure** and production chains at handicraft centres, specifically in remote regions.

❖ **Marketing Support and Services Scheme**

- This scheme **provides interventions for domestic marketing events to artisans in the form of financial assistance** that aids them in organising and participating in trade fairs and exhibitions across the country and abroad.

❖ **Research and Development Scheme**

- This initiative was introduced to **generate feedback on economic, social, aesthetic and promotional aspects of crafts and artisans** in the sector, with the objective of supporting implementation of aforementioned schemes.

❖ **National Handicraft Development Programme**

- The important component of this programme is carrying out surveys, upgrading design and technology, developing human resources, providing insurance and credit facilities to artisans, R&D, infrastructure development and marketing support activities.

❖ Comprehensive Handicrafts Cluster Development Scheme

- The approach of this scheme is to scale up infrastructure and production chain at handicraft clusters. Additionally, this scheme aims to provide adequate infrastructure for production, value addition and quality assurance.

❖ Export Promotion Council for Handicrafts

- The main objective of the **council is to promote, support, protect, maintain and increase the export of handicrafts.**
- The other activities of the council are knowledge dissemination, providing professional advice and support to members, organizing delegation visits and fairs, providing liaison between exporters and the government and carrying out awareness workshops.

The handicrafts industry employs a vast segment of craftspersons in rural & semi-urban areas and generates substantial foreign exchange for the country while preserving its cultural heritage. The rural development ministry has identified 152 blocks nationwide where the Startup Village Entrepreneurship Programme is set to take off, extending the startup movement much beyond select metros. More than 1,200 ideas for small enterprises will be taken up under this initiative pertaining to handicrafts and handloom, among others. The ministry is also in talks with the Department of Industrial Policy and Promotion which recently launched the Startup India initiative along with a detailed action plan

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CHAPTER – 08**IMPORTANCE OF ENVIRONMENTAL STUDY IN SCHOOL EDUCATION****DR. U.K. SHUKLA***Assitt. Professor, A.H. & Dairying, Faculty of Agriculture, MGCGV, Chitrakoot, Satna, MP***8.1 INTRODUCTION : ENVIRONMENT**

Environment can be defined as a sum total of all the living and non-living elements and their effects that influence human life. While all living or biotic elements are animals, plants, forests, fisheries, and birds, non-living or abiotic elements include water, land, sunlight, rocks, and air. Built environment, constructed surroundings that provide the setting for human activity, ranging from the large-scale civic surroundings to the personal places. Environmental education is an understanding of the world around humans, the complexities, problems, and positives, and the same should be imparted from childhood as it prepares students to be more responsible citizens and makes them more conscious of their environmental footprint. In addition to encouraging a sustainable lifestyle, environmental education has a domino effect on the community and nation as a whole.

The advantages of environmental education include a change in mindset as students learn to have problem-solving skills and analytical skills to find solutions to an existing problem. As students learn to explore different ways to resolve real-world environmental problems, they

**Figure : Natural Environment**

also pick up essential skills like leadership, collaboration, reasoning, critical thinking, and interdisciplinary approaches to issues and challenges. Associating with nature and outdoor activities is also a part of environmental learning and this can lead to low stress and anxiety levels by encouraging a feeling of well-being, confidence, and happiness.

Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions. The components of environmental education are:

- **Awareness and sensitivity** to the environment and environmental challenges
- **Knowledge and understanding** of the environment and environmental challenges
- **Attitudes** of concern for the environment and motivation to improve or maintain environmental quality
- **Skills** to identify and help resolve environmental challenges
- **Participation** in activities that lead to the resolution of environmental challenges

Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills. The attitude of caring for the environment and being aware of our actions towards Mother Nature doesn't develop overnight. This requires adults to create awareness in children right from the early years. Therefore, the concept of understanding our environment and maintaining the balance needs to be driven through the curriculum and activities at school. Technological advancement and progress in every field has helped mankind but at the same time it has caused irreversible damage to the planet. We are alarmed with issues like increase in pollution levels, global warming, deforestation, wild fires, floods and draughts, paucity of food, etc. Immediate and urgent steps have to be taken by every individual in order to save what is left and work towards building a sustainable future for all.

8.2 TYPES OF ENVIRONMENT

The environment refers to our immediate surroundings in which all living and non-living components co-exist. It can be used to refer to the social, natural or built environment. The environment has a huge impact on an individual's behaviour and intellect. The environment plays a critical role in the survival of life on our planet. Environment is derived from the French word "environment," which means "environment." A Biosphere's basis is an

ecosystem, which has an impact on the health of the entire planet Earth. All living and non-living things in the environment are included. There are two different types of environment (1) Geographical Environment (2) Man-made Environment

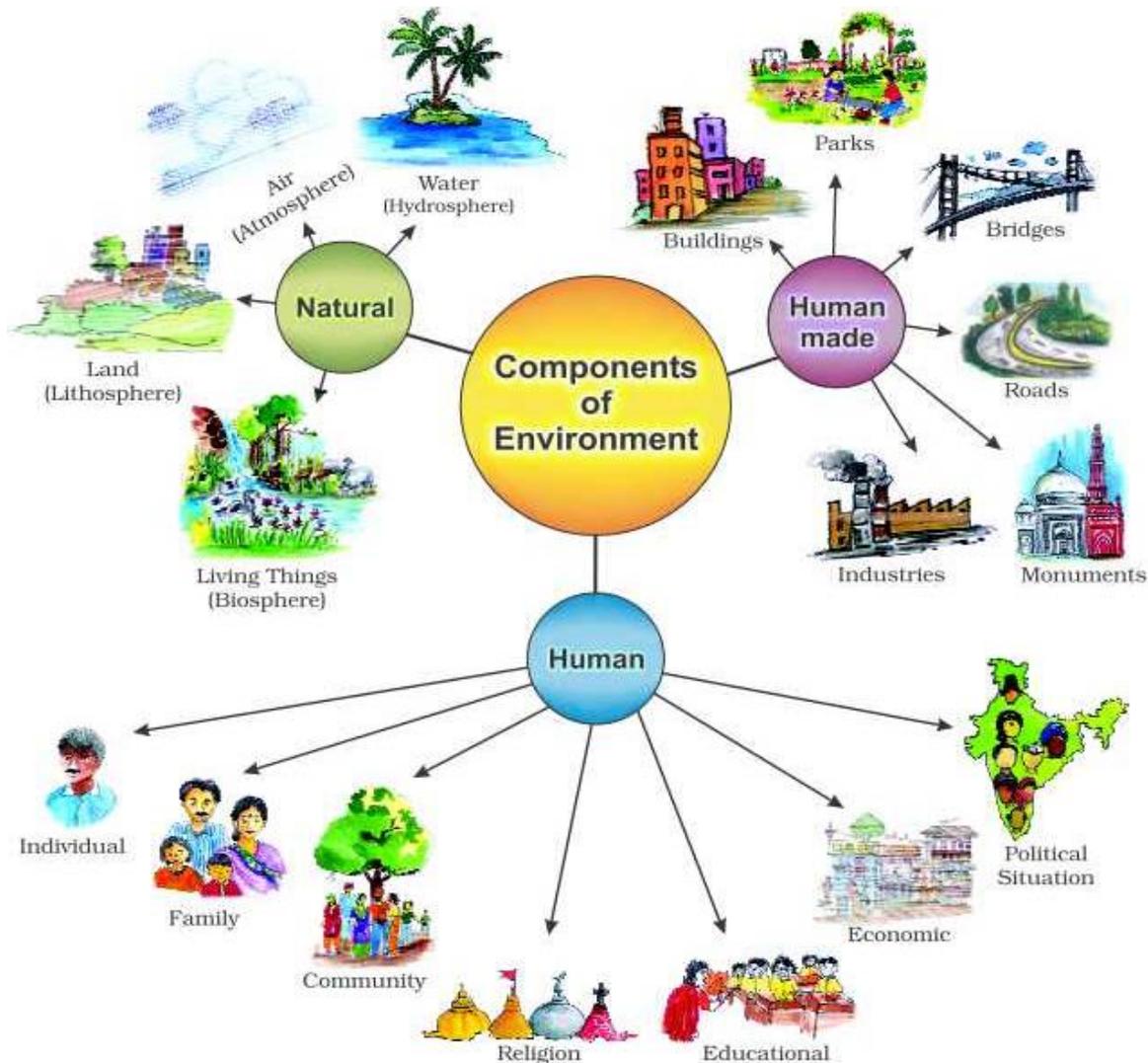


Figure : Components of Environment

8.2.1 GEOGRAPHICAL ENVIRONMENT

Geographical environment refers to the terrestrial environment, which is made up of a variety of natural and environmental factors. It is the complement of direct interaction involving nature and human society, even though it developed independently of people. The geographical environment involves geology, the sciences of climatology, and biogeography. It consists of all components provided by nature and hence can be called as the natural

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man in order to regulate and monitor certain environmental conditions. Some address it as a social-cultural environment. It can further be divided into two types of environments. A manmade environment includes every material and non-material concept created by man.



It will exist as long as human society exists. But the geographical environment includes everything natural, and it does not depend upon human existence. This is an easy way to differentiate between the two. There are two types of man-made environments which are as given below

- A) Inner Environment
- B) Outer Environment

❖ **THE INNER ENVIRONMENT**

The inner environment is often called the 'social heritage' as it is an important factor for humankind to exist, live and arise. It is entirely dependent on human social influence. It is a social environment and it exists as long as a particular society exists. It pertains to the regulations, traditions, organizations and institutions. It involves customs and folkways which is existent in every human group. It is addressed with names such as non-material culture,

social heritage etc. This heritage is essential for the social life of humans to flourish, it is known to have an influence on an individual's life. The altered form of the economic and physical environment artificial environment, are seen as two different aspects of the man-made environment.

❖ THE OUTER ENVIRONMENT

The outer environment is the physical environment that man has created on his own with the evolving technology and science. Through advancement in the field of science and technology, humans have attempted to alter conditions of their physical environment. This outer environment is as a result of these modifications which includes modern infrastructure in cities, our homes and their associated amenities, our modes of communication and transport, our resorts to conveniences and luxury, different kinds of industry manufacturing luxurious commodities, electrical appliances and so on which ultimately aims at civilization and urbanization.

8.3 COMPONENTS OF THE ENVIRONMENT

Environment can be defined as a sum total of all the living and non-living elements and their effects that influence human life. While all living or biotic elements are animals, plants, forests, fisheries, and birds, non-living or abiotic elements include water, land, sunlight, rocks, and air. Broadly there are two types of Environmental components.

- A) Biological component
- B) Physical component

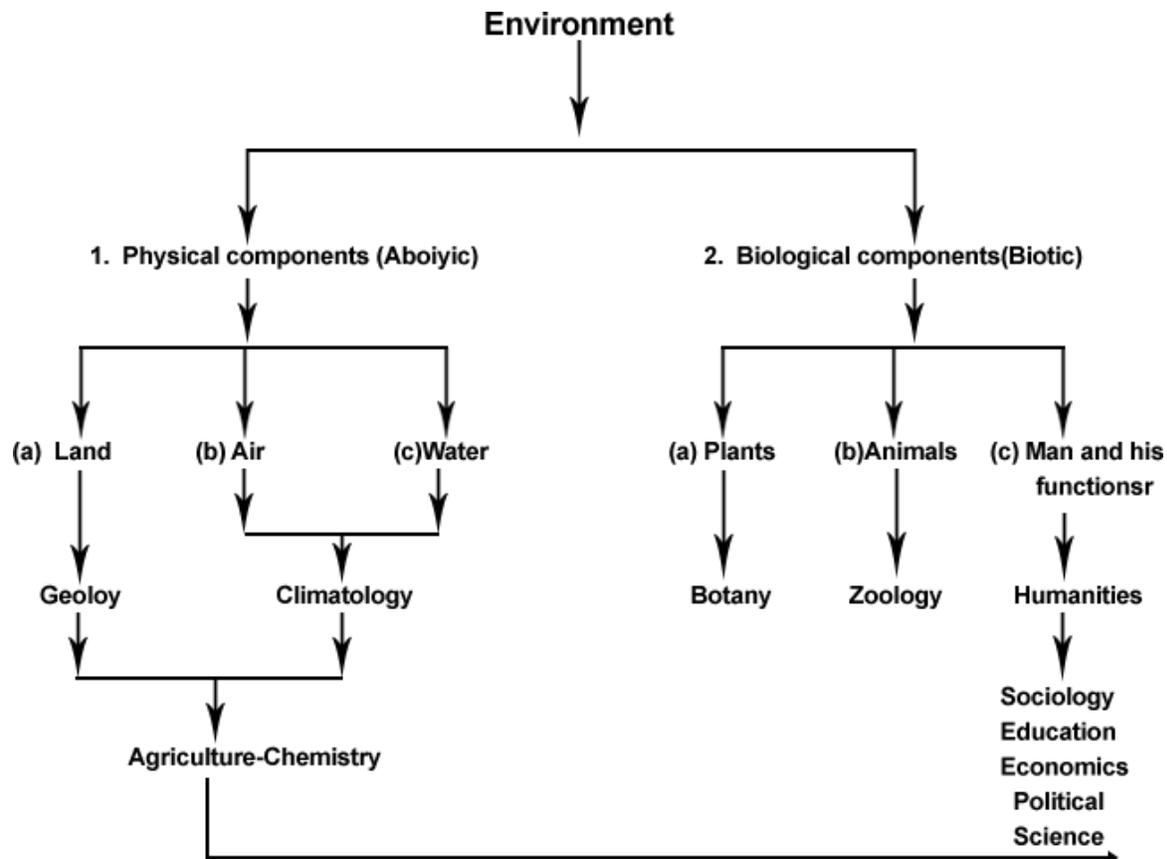
8.3.1 BIOLOGICAL COMPONENT

The biological component of the environment, as the name indicates, includes all living things. Hence, it is also called as the biotic component of the ecosystem. Animals, plants and microorganisms interact with the abiotic components, and these form various ecosystems. Moreover, organisms in these ecosystems are classified into groups such as producers, consumers and decomposers. They also occupy various trophic levels on the food chain. For instance, all autotrophs are producers and occupy the lowest levels on a food chain.

8.3.2 PHYSICAL COMPONENT

The physical component refers to the non-living part of the environment. These are also called abiotic factors and include air, water, soil, climate etc. Physical components can be broadly classified into 3 groups like Atmosphere, Hydrosphere and Lithosphere. Additionally,

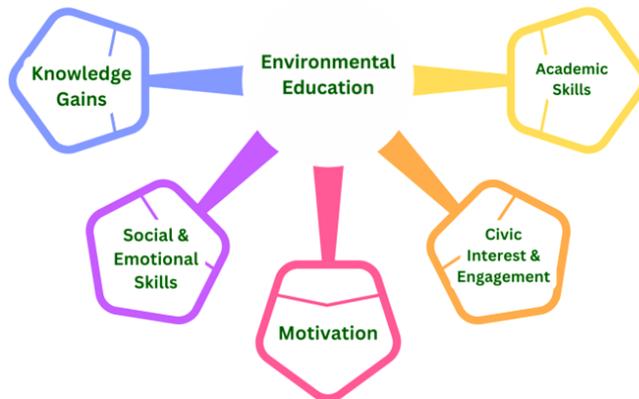
scientists also use the term “biosphere” to describe the zone of life (or the worldwide sum of ecosystems).



8.4 AIMS & OBJECTIVES OF ENVIRONMENTAL EDUCATION

The primary aim of environmental education is to impart knowledge about the principles required for the conservation and utilization of natural resources for the existence of mankind. Environmental education gives required knowledge and experience realizing the value of such important views. Aims and objectives of environmental education emphasizes the relationship between man and the environment. The primary purpose of environmental education is to impart knowledge about the environment’s importance and to inculcate responsibility towards its protection and maintenance.

Environmental education aims to educate young people about the importance of nature and the environment. It encourages young minds to take responsibility for protecting the natural environment and to develop environmental awareness. Incidentally to promoting awareness and a sense of respect for nature leads to a comprehensive understanding of the



environment and a reasonable attitude towards protecting it. Environmental education aims to develop a sense of responsibility amongst the nature of the world to take collective actions towards the conservation and preservation of the natural environment. Environmental education aims to encourage individuals to learn about nature,

develop skills to protect it, and be a part of the global effort towards tackling and solving issues related to the environment.

Besides, environmental education fosters the skills that enable the attitude and expertise to understand the natural environment, its limitations, criticality, and the essential ways to prevent it from harm. The objectives of environmental education are to increase public awareness about environmental issues, explore possible solutions, and to lay the foundations for a fully informed and active participation of individual in the protection of environment and the prudent and rational use of natural resources.

8.5 ENVIRONMENTAL STUDY FOR SCHOOL EDUCATION

Environmental education helps students understand how their decisions and actions change the environment, strengthens knowledge and skills needed to address complex environmental issues, and ways we can take action to keep our environment strong and sustainable for the future. The main scope of Environmental Education knows the Biological, Sociological, Physical aspects. Environmental education is a dynamic process. The priority of such education is to develop cautious mind of people about their total surrounding. Its main task is to impart proper knowledge and training to solve various problems of our environment systematically.

Environmental education is a crucial part of the school curriculum. It promotes awareness and understanding of the environment, its natural resources, and the need for sustainable practices. Environmental Studies at the primary stage envisages exposing children to the real situations in their surroundings to help them connect, be aware of, appreciate and be sensitized towards the prevailing environmental issues (natural, physical, social and cultural). Environmental Studies are concerned with a variety of issues, including the protection of

natural resources, pollution management, and the influence of a growing human population on the environment. To solve these complex environmental issues, a multidisciplinary approach is necessary. The goals of environmental education are (1) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment (2) to create new patterns of behavior of individuals, groups, and society as a whole towards the environment.

8.6 REASONS OF WE NEED ENVIRONMENTAL EDUCATION

Take advantage of and strengthen the potential of children, adolescents and young people to face the challenges related to climate change, Climate crisis, environmental degradation and biodiversity are existential threats to children's ability to survive and thrive, and negatively affect access to water, sanitation and hygiene services.

Education plays a key role in climate action. However, what we have learned does not prepare us for the challenge we face as a society. It is imperative, then, to incorporate environmental education in schools. But why do we need environmental education, here are five things we need to know

- Environmental education is more than just information about the environment. Environmental education increases awareness and knowledge about environmental issues; teaches individuals to think critically; improves problem-solving and decision-making skills.
- Access to environmental education for children will help them prepare to face the effects of climate change comprehensively from a responsible citizen's point of view, defending and being consistent with these values in all areas.
- Environmental education bestows students with appropriate skills, knowledge, behaviors and attitudes to cope with a rapidly changing world and climate and promotes both personal and systemic transformation towards more sustainable lifestyles.
- Through education, children can contribute to all aspects of climate change policymaking, mitigation and adaptation.
- Schools are spaces to create and implement environmental solutions that generate more sustainable lifestyles and strengthen resilience to climate change.

Climate crisis, environmental degradation and biodiversity are existential threats to children's ability to survive and thrive, and negatively affect access to water, sanitation and hygiene services. The potential of children and youth as agents of change must be seized and

strengthened from the school level, placing education at the center of their empowerment to participate and lead processes, programs and policy initiatives that address the main challenges related to climate change, including ecosystem restoration and conservation processes, new patterns of production and consumption, as well as adaptation to sustainable lifestyles. Children are powerful agents for change. When access to essential services such as water and sanitation, health and education is improved, their ability to survive climate hazards can be greatly enhanced.

8.7 STATUS OF ENVIRONMENTAL EDUCATION IN SCHOOL EDUCATION

The education system in India had incorporated certain aspects of environment in school curricula as early as 1930. The Kothari commission (1964-66) also suggested that basic education had to offer environmental education and relate it to the life needs and aspirations of the people and the nation. At the primary stage, the report recommended that " the aims of teaching science in the primary schools should be to develop proper understanding of the main facts, concepts, principles and processes in physical and biological environment" Environmental education at primary, secondary, higher secondary levels was treated in a different way. Environmental education is an essential part of every pupil's learning. It helps to encourage awareness of the environment, leading to informed concern for active participation in resolving environmental problems. It was introduced without any delay from class - 1 as Environmental study, as a subject so that right from their childhood, the right attitudes towards environment will be nurtured in the young minds.

It is important that we capture this enthusiasm and that no opportunity is lost to develop knowledge, understanding and concern for the environment through school education. The curricular, cross-curricular attempt of environmental education also should be a joy for the learner. In this direction, NCERT has published in collaboration with the Centre for Environmental Education, Ahemadabad a book titled "Joy of learning" with lot of environmental activities, a handbook for teachers. Similarly, several workshops were conducted to orient school teachers and educational functionaries of the state boards on various aspects of environmental education. Strategies for successful implementation of Environmental education in schools were discussed in detail in these interactions.

8.9 CONCLUSION

Environmental challenges are all around us like climate change, loss of biodiversity, ozone layer depletion, destruction of habitats, depleting ground water supplies, introduction of alien species, environmental pollution, solid waste disposal, and storm water and sewage

disposal. Education encourages the people to use energy and water more efficiently and recycle household waste. By increasing awareness and concern about the environment, the human impact on the environment can be reduced by more efficient use of energy, water and other resources. Children's thoughts, actions and beliefs are molded by their environment over time. They constantly watch, listen, learn and emulate the way people act around them. As parents and educators, it's our duty to ensure we are intentionally setting a positive example and influencing our children toward success. Environmental education also teaches students about the interdependence of living things and how they are all connected.

This understanding can help to promote respect for all forms of life and encourage students to take actions that protect and preserve the natural environment. One of the main challenges with traditional environmental education is that it often focuses on imparting knowledge and raising awareness, rather than fostering skills and creating opportunities for action. It is always a barrier in implementing environmental education in the classroom as one teacher can learn skills easily but to achieve rigorous expertise in one's subject is quite difficult. Not everyone is capable of handling child pedagogy along with having expertise in one's subject matter.

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CHAPTER – 09

LIVESTOCK : MAJOR SOURCE OF RURAL LIVELIHOOD'S

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9.1 INTRODUCTION

A Livelihood can be defined as the activities, the assets and the access that jointly determine the living gained by an individual or household. When it comes to an individual, a livelihood is the ability of that individual to obtain the basic necessities in life, which are food, water, shelter and clothing. Therefore all activities involved in finding food, searching for water, shelter, clothing and all necessities required for human survival at individual and household level are referred to as a livelihood. Livestock are the domesticated animals raised in an agricultural setting to provide labor and produce diversified products for consumption such as meat, eggs, milk, fur, leather, and wool. The term is sometimes used to refer solely to animals that are raised for consumption, and sometimes used to refer solely to farmed ruminants, such as cattle, sheep, goats, and pigs. Livelihood assets refer to the resource base of the community and of different categories of households. In the centre left of the diagram above we have a pentagon that stands for different types of assets available to local people - human, natural, financial, physical and social. These assets are interlinked.

India is on first rank on the livestock resources followed by United States of America. The total livestock in India are 14% Cows and Oxen, and 57 % buffaloes of the world. However, buffaloes contribute 53 % in total country's milk production. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8 % of the population in India. India has vast livestock resources. In most rural areas of the world, approximately 90 % of the population is involved in farming as a way of earning a living. Small-scale farming, fishing, raising livestock and non-farm activities are some of the common livelihoods that these populations survive on.

9.2 LIVESTOCK AND RURAL LIVELIHOOD'S

Livestock sector is a pillar of the global food system and contributes to poverty reduction, food security and agricultural development. Livestock plays an important role in Indian economy. About 20.5 million people depend upon livestock for their livelihood. Livestock

contributed 16% to income of small farm household. Livestock sector plays a multi-faceted role in socio-economic development of rural households. Livestock rearing has significant positive impact on equity in terms of income and employment and poverty reduction in rural areas as distribution of livestock is more egalitarian as compared to land.

In India, over 70 percent of the rural households own livestock and a majority of livestock owning households are small, marginal and landless households. Small animals like sheep, goats, pigs and poultry are largely kept by the land scarce poor households for commercial purposes due to their low initial investment and operational costs. In the recent decade, demand for various livestock based products has increased significantly due to increase in per capita income, urbanization, taste and preference and increased awareness about food nutrition. Livestock sector is likely to emerge as an engine for agricultural growth in the coming decades. It is also considered as a potential sector for export earnings.

Rural Poverty is largely concentrated among the landless and the marginal households comprising about 70 percent of rural population. Several empirical studies indicate that livestock rearing has significant positive impact on equity in terms of income and employment and poverty reduction in rural areas as distribution of livestock is more egalitarian compared to land. In India, over 70 percent of the rural households own livestock and a majority of livestock owning households are small, marginal and landless households. Small animals like sheep, goats, pigs and poultry are largely kept by the land scarce poor households for commercial purposes because of their low initial investment and operational costs.

9.3 LIVESTOCK AND INDIAN ECONOMY

Livestock has potential to improve livelihoods of the rural people which depend on complex economic linkages and behavior. Animals are an essential asset to the rural and poor as both these are directly engaged in agricultural production and poor non-farm rural households who rely on local population for affordable nutrition. In most developing countries the majority of rural income arises from marketing primary food products. Livestock contribution to this income depends on complex market supply chains extending from farm to urban households. In developing countries livestock are crucial for people's livelihoods.

In areas where there is hunger, livestock are integrated into the farm production. The cow creates manure which is a natural fertilizer which fertilizes the maize which both humans and livestock can eat. So we can say that livestock is the mainspring of maintaining this

system. In case of draught conditions if livestock is present it can still catch income and a food source.

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% for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8 % of the population in India. India has vast livestock resources. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP. Livestock, poultry and dairy are the fastest-growing subsectors in recent years and the growth in agriculture is to a large extent fueled by the growth of these subsectors. Demand for livestock products is expected to rise with the rise in incomes and growing urbanization.

9.4 CONTRIBUTION OF LIVESTOCK IN THE INDIAN ECONOMY

Animals like sheep and goat serve as sources of income during emergencies to meet exigencies like marriages, treatment of sick persons, children education, repair of houses etc. The animals also serve as moving banks and assets which provide economic security to the owners. Agriculture is the mainstay of livelihoods for the majority of the households. Salaried job, skilled non-farm job, and remittances are more remunerative livelihood sources; however only a few households adopt these activities due to lack of education, assets, investment capital, and skills.

Livestock help improve food and nutritional security by providing nutrient-rich food products, generate income and employment and act as a cushion against crop failure, provide draught power and manure inputs to the crop subsector, and contribute to foreign exchange through exports. Some of the landmark and contribution of livestock in the Indian economy are

- The livestock sector grew at a CAGR of 7.9% during 2014-15 to 2020- 21 (at constant prices), and its contribution to total agriculture GVA (at constant prices) has increased from 24.3% in 2014-15 to 30.1% in 2020-21.
- Besides their monetary benefit and providing a steady stream of food and revenues for households, livestock provide employment to the rural family, act as insurance during crop failures and the number of livestock owned by a farmer determines the social status among the community.
- Dairy is the single-largest agri commodity in India. It contributes 5% to the national economy and employs 80 million dairy farmers directly.

9.5 CONTRIBUTION OF LIVESTOCK TO PEOPLE

The livestock provides food and non-food items to the people. Livestock Sector not only provides essential protein and nutritious human diet through milk, eggs, meat etc but also plays relevant role in utilization of non-edible agricultural by-products. Livestock also provides raw material/by products such as hides and skins, blood, bone, fat etc

- ❖ **Food:** The livestock provides food items such as Milk, Meat and Eggs for human consumption. India is number one milk producer in the world. It is producing about 176.34 million tones of milk in a year. Similarly it is producing about 95.22 billions of eggs, 7.70 million tonnes of meat in a year. The value of output of livestock sector at current prices was Rs 9,17,910 crores at current prices which is about 31.25% of the value of output from agricultural and allied sector. At constant prices the value of output from livestock was about 31.11% of the value of the output from total agriculture and allied sector. the total fish production in India is estimated at 12.61 Million Metric tonnes.
- ❖ **Fibre and skins:** The livestock also contributes to the production of wool, hair, hides, and pelts. Leather is the most important product which has a very high export potential. India is producing about 41.5 million Kg of wool per annum.
- ❖ **Draft:** Bullocks are the back bone of Indian agriculture. Despite lot of advancements in the use of mechanical power in Indian agricultural operations, the Indian farmer especially in rural areas still depend upon bullocks for various agricultural operations. The bullocks are saving a lot on fuel which is a necessary input for using mechanical power like tractors, combine harvesters etc. Pack animals like camels, horses, donkeys, ponies, mules etc are being extensively used to transport goods in different parts of the country in addition to bullocks. In situations like hilly terrains mules and ponies serve as the only alternative to transport goods. Similarly, the army has to depend upon these animals to transport various items in high areas of high altitude.
- ❖ **Dung and other animal waste materials:** Dung and other animal wastes serve as very good farm yard manure and the value of it is worth several crores of rupees. In addition it is also used as fuel (bio gas, dung cakes), and for construction as poor man's cement (dung).
- ❖ **Storage:** Livestock are considered as 'moving banks' because of their potentiality to dispose off during emergencies. They serve as capital and in cases of landless agricultural labourers many time it is the only capital resource they possess. Livestock serve as an

asset and in case of emergencies they serve as guarantee for availing loans from the local sources such as money lenders in the villages.

- ❖ **Weed control:** Livestock are also used as Biological control of brush, plants and weeds. Biological control is the deliberate use of a weed's "natural enemies" to suppress its population. A weed's natural enemies may be arthropods (insects, mites and their relatives), bacteria or fungi.
- ❖ **Cultural:** Livestock offer security to the owners and also add to their self esteem especially when they own prized animals such as pedigreed bulls, dogs and high yielding cows/ buffaloes etc.

9.6 ROLE OF LIVESTOCK IN FARMERS' ECONOMY

The livestock plays an important role in the economy of farmers. The farmers in India maintain mixed farming system i.e. a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise thereby realize the resource efficiency. The livestock serve the farmers in different ways.

- ❖ **Income:** Livestock is a source of subsidiary income for many families in India especially the resource poor who maintain few heads of animals. Cows and buffaloes if in milk will provide regular income to the livestock farmers through sale of milk. Animals like sheep and goat serve as sources of income during emergencies to meet exigencies like marriages, treatment of sick persons, children education, repair of houses etc. The animals also serve as moving banks and assets which provide economic security to the owners.
- ❖ **Employment:** A large number of people in India being less literate and unskilled depend upon agriculture for their livelihoods. But agriculture being seasonal in nature could provide employment for a maximum of 180 days in a year. The landless and less land people depend upon livestock for utilizing their labour during lean agricultural season.
- ❖ **Food:** The livestock products such as milk, meat and eggs are an important source of animal protein to the members of the livestock owners.
- ❖ **Social security:** The animals offer social security to the owners in terms of their status in the society. The families especially the landless which own animals are better placed than those who do not. Gifting of animals during marriages is a very common phenomenon in different parts of the country. Rearing of animals is a part of the Indian culture. Animals are used for various socio religious functions. Cows for house warming

ceremonies; rams, bucks and chicken for sacrifice during festive seasons; Bulls and Cows are worshipped during various religious functions. Many owners develop attachment to their animals.

- ❖ **Draft** : The bullocks are the back bone of Indian agriculture. The farmers especially the marginal and small depend upon bullocks for ploughing, carting and transport of both inputs and outputs.
- ❖ **Dung**: In rural areas dung is used for several purposes which include fuel (dung cakes), fertilizer (farm yard manure), and plastering material (poor man's cement).

9.7 ISSUES RELATED TO LIVESTOCK IN INDIA

There are many challenges the sector will come across, during the process of achieving any set target in the future, like disease outbreaks, antimicrobial resistance, greenhouse gas emission, inadequate human resources and infrastructure for veterinary services, low productivity of animals, non-remunerative milk prices

- ❖ **Lack of Transparency** : Nearly half of the country's livestock is still unclassified. Also, Indian livestock product markets are mostly underdeveloped, uncertain, lack transparency and often dominated by informal market intermediaries.
- ❖ **Rising Animal Diseases** : There has been an increase in communicable diseases among animals. Most recent is the outbreak of lumpy skin disease (LSD) in cattle across various states of India.
- ❖ **Lack of Extension Services** : While the role of extension services in enhancing crop production and productivity is widely recognized, livestock extension never got the attention it deserves, and this has been one of the reasons for low productivity of India's livestock sector.

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CHAPTER – 10

RURAL POLICIES AND PROJECTS OF GOVERNMENT OF INDIA

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10.1 INTRODUCTION

According to the 2011 Census of India, 83.3 percent of the country's 121 million people reside in rural areas. Because of this, around 70% of people in India live in rural areas. These rural people are characterized by a high unemployment rate, pervasive poverty, low income and literacy levels, as well as poor nutrition and health. In order to address these unique issues, a number of rural development programs are being launched to open up possibilities for raising the quality of life for these rural residents. And it is a procedure that enhances the quality of life of rural residents, especially the poor, over the long term. Aiming to address the basic requirements of rural dwellers, such as food, shelter, and clothes, rural development programs work to eliminate poverty and unemployment as well as to promote health and education.

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), the Rastriya Sama, Vikas Yojana (RSVY), the Indira Awas Yojana (IAY), the Sampoorna Grameen Rozgar Yojana (SGRY), the Integrated Tribal Development Project (ITDP), and the Pradhan Mantri Gram Sadak Yojana were all launched by the Government of India through the Planning Commission of India to improve rural people's conditions (PMGSY).

10.2 RURAL DEVELOPMENT

The term "Rural Development" connotes overall development of rural areas with a view to improve the quality of life of rural people. In this sense, it is a comprehensive and multidimensional concept and encompasses the development of agriculture amid allied activities, village and cottage industries and crafts, infrastructure, community services and facilities and above all the human resources in rural areas. In fact, rural development is the end result of interactions between various physical, technological, economic, socio cultural and institutional factors.

10.3 GOALS AND OBJECTIVES OF RURAL DEVELOPMENT PROGRAMS

The government's objective for rural development through policies and programs are:-

- Creation of employment opportunities under MGNREGA leading to enhancement of sustainable livelihoods of the rural people
- Formation of agripreneurs with emphasis on agro processing and propagating modern extension services.
- Transform rural economy through modern rural infrastructure and an integrated value chain.
- Skilling of rural youth for remunerative job opportunities.
- Engaging women self help groups in maintenance of rural roads.
- Access to clean energy with housing facilities.
- Increase capacity and reach of public transport.
- Revisiting criteria for identifying rural habitants for road connectivity.

10.4 POLICIES AND PROGRAMS OF GOVERNMENT FOR RURAL DEVELOPMENT

Through the Ministry of Rural Development, the Indian government has consistently prioritized programs for rural development aimed at improving the rural sector of our nation. To create numerous programs for rural India, the Department of Rural Development and the Department of Land Resources were specifically established. As rural India also contributes significantly to the Indian economy, its development is crucial for both broader social change and the economic well-being of its citizens. In order to give the rural population better prospects for economic development, decentralization of planning, improved enforcement of land reforms, and increased access to financing are all necessary.

- **MAHATMA GANDHI NATIONAL RURL EMPLOYMENT GUARANTEE ACT (MGNREGA)**

This is one of the most important and effective scheme for rural development. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) of 2005 guarantees 100 days of employment to any rural household adult who wants to do unskilled manual work in a financial year. The Act seeks to provide employment opportunity to the working people in order to fulfill their fundamental right to live life with dignity.

Under this act, if a person does not get a job within 15 days, he is eligible for getting unemployment allowance. It also highlights the significance of basic right to work. In current FY 2022-23, 5.54 crore households have been provided employment and 224.98 crore person days of employment have generated. The programme has high work participation from the marginalized groups like SC/ST (of 38%), women (of 56.31%) during FY 2022-23. For strengthening natural resource base in 2022-23 so far 87.83 lakh works related to natural resource management costing approximately Rs. 42,38,888.53 lakhs has been taken up.

Table 1: Progress under Mahatma Gandhi NREGA for FY 2022-23

SN	Indicator	FY 2022-23 (till 31.12.2022)
1	Approved labour budget (in crore)	245.44
2	No.of households worked (in crore)	5.54
3	No. of persons worked (in crore)	7.73
4	Person days generated(in crore)	224.98
5	Number of completed works (in lakh)	72.62
6	% of expenditure on NRM works	66.4
7	% of expenditure on agriculture & agri allied works	68.46
8	Total central release (in Rs. Crore)	66241

Source : (Annual Report, 2022-23)

▪ **PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)**

This scheme was launched by then Prime Minister Atal Bihari Vajpayee on 25 December 2000. The programme seek to provide all weather connectivity to habitation with more than 500 population in plain and more than 250 population in tribal areas as per 2001 census. The motive of this scheme is to provide better rural road connectivity in order to provide connectivity to the residents with less or no connectivity at all. It seeks to poverty reduction by promoting access to economic and social services. This program is funded by both state and central government after the recommendation of 14th Finance Commission report. According to the latest data provided on the PMGSY website, 5,98,786 km of road length has been constructed till march, 2019 under PMGSY of which 1,76,527 km are in 5 year guarantee period and 3,75,394 are beyond defect liability period.

▪ **PRADHAN MANTRI AWAAS YOJANA (GRAMIN)/INDIRA AWAS YOJANA**

The programme came into effect from 1st April 2016 and was launched by the hon'ble prime minister on 20th November, 2016. Indira Awas Yojana was given a new name of Pradhan Mantri Gramin Awaas Yojana in 2016. This is a welfare scheme launched by the Government with the aim of providing housing to rural poor people and on the job training of rural masons for construction of houses in India.

The objective of this programme is reaching the target of providing home to all Indian citizens till 2022. Constructing cost of the houses is shared by both, the centre and the state governments in the ratio 60:40 in plain areas and 90:10 for north- eastern and 2 hill states (himanchal Pradesh and uttarakhand) and UT of Jammu and Kashmir. In respect of other union territories, 100% cost is borne by the Government of India. Except Delhi and

Chandigarh, this scheme has been implemented in rural areas all over India. Provision of assistance (Rs.12000/-) for toilets through convergence with Swachh Bharat Mission-Gramin (SBM-G), MGNREGS or any other dedicated source of funding (Provision of 90/95 person days of un-skilled wage labour under MGNREGS for construction of house, over and above the unit assistance). Basic facilities will also be provided with the house like toilet, electricity connection, potable water connection, LPG connection etc. under PMAY-G, against the target of construction of 2.95 crore houses from 2016-17 to 2021-22, a total of 1.25 crore rural houses have already been completed as on 26th September, 2019.

▪ **DEENDAYAL ANTYODAYA YOJANA/NATIONAL RURAL LIVELIHOOD MISSION (DDY NRLM)**

Swarnjayanti Gram Swarozgar Yojana which is revamped as National Rural Livelihood Mission or Deendayal Antyodaya Yojana was launched in 2011 by Ministry of Rural Development. It is also known as Ajeevika, this scheme facilitates mobilization of women self help groups for promotion of their social and economic empowerment. Currently, the program cover 5733 blocks in 643 districts across all 29 states and 5 UTs. Under this scheme, a loan of 3 lakh rupees is provided at an interest rate of 7% which can be reduced to 4% at the time of repayment. The program was financed with the support of the World Bank.

Table 2 : NRLM Footprint - Progress In All Intensive Blocks

S.N	Particulars (upto December 2022)	Progress
1	States	28
2	Union territories transited	06
3	Districts entered	723
4	Intensive block under implementation	6893
5	Household covered (in lakh)	875.34
6	SHGs promoted (in lakh)	81.24
7	Village organizations (VOs) promoted (in lakh)	4.73
8	Cluster level federations (CLFs) (in lakh)	30862
9	SHGs provided revolving fund (RF) (in lakh)	41.84
10	SHGs provided community investment fund (CIF) (in lakh)	23.22
11	Amount of RF distributed (in Rs. Lakh)	617285.76
12	Amount of CIF distributed (in Rs. Lakh)	1407712.37

Source : DAY-NRLM MIS (Annual Report, 2022-23)

The main objective of the scheme is to provide efficient as well as effective institutional platforms to the poor with the aim of increasing household income by improving access to

financial services. NRLM also helps to uplift the poor so that they can actively participate in India's economic growth.

▪ **SKILL DEVELOPMENT PROGRAMME**

DDU-GKY and RSETIs are two skill development schemes of the department. The Ministry of Rural Development (MoRD) announced the Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) on Antyodaya Diwas - 25th September 2014. DDU-GKY is part of the National Rural Livelihood Mission (NRLM) whose mission is to diversify the income of the rural poor families and serve the career aspirations of the rural youth. DDU-GKY has a unique focus on rural youth aged 15-35 from poor families.

As part of the Skill India campaign, it plays an important role in supporting the government's social and economic programs such as Make in India, Digital India, Smart Cities and Start-Up India, Stand-Up India. Over 180 million or 69% of the country's youth population between the ages of 18 and 34 years, live in its rural areas. Out of these, the bottom of the pyramid youth from poor families with no or marginal employment number about 55 million. Key achievements of DDU-GKY in FY 2022-23:-

- During FY 2022-23 a total of 1,32,923 candidates have been trained and at total of 63,570 candidates have been placed and Rs. 8.90 crores have been released to states.
- Currently DDUGKY projects are being implemented by 877PIAs under 1891 projects inn2369 training centre across the country.
- A total of Rs. 13.04cr has been released for implementation of projects under DDU-GKY during 2021-22.

The Rural Self Employment Training Institute (RSETIs) is promoted by the government in partnership with commercial banks. RSETIs provide training to set up self-employment ventures. The banks also help their trainees to access bank finance. Many RSETIs especially in southern states have drawn in significant financial contribution from corporate and philanthropists in setting up the RSETIs. RSETIs have trained 21 lakh unemployed youth in last five years (FY 2014-15 to June 2019) people since its inception to march 2019.

▪ **NATIONAL SOCIAL ASSISTANCE PROGRAMME**

The national social assistance programme (NSAP) has five components. National Old Age Pension Scheme, (NOAPS), pension to widows, pension to the disabled, national family benefit scheme (NFBS) and Annapurna

- A. Indira Gandhi National Old Age Pension Scheme (IGNOAPS)** : under the scheme assistance is provided to person of 60 years and above and belonging to family living below poverty line as per the criteria prescribed by Government of India. Central assistance of Rs. 200/- per month is provided to person the age group of 60-79 years and Rs. 500/- month to person of 80 years and above.
- B. Indira Gandhi National Widow Pension Scheme (IGNWPS)** : under the scheme central assistance Rs. 300 per month is provided to widows in the age group of 40-79 years and belonging to family living below poverty lines as per the criteria prescribed by Government of India. Central assistance of Rs. 500/- month is provided to the beneficiaries of age of 80 year and above.
- C. Indira Gandhi National Disability Pension Scheme (IGNDPS)** : under the scheme central assistance Rs. 300 per month is provided to person aged 18-79 years with severe and multiple disabilities and belonging to family living below poverty lines as per the criteria prescribed by Government of India. Central assistance of Rs. 500/- month is provided to the beneficiaries of age of 80 year and above.
- D. National Family Benefit Scheme (NFBS)** : under the scheme, BPL household is entitled to a lumpsum amount of money on the death of the primary breadwinner aged between 18-59 years. The amount of assistance is Rs. 20000/-.
- E. Annapurna Scheme** : under the scheme, 10kg of food grains per month are provided free of cost to those senior citizens, who, though eligible under IGNOAPS, are not receiving old age pension.

▪ **SHYAMA PRASAD MUKHERJI RURBAN MISSION (SPMRM)**

The Shyama Prasad Mukherji Mission for Rural Development (SPMRM) was launched in 2016 to promote a cluster-based approach to rural development. The objective of the program is to develop such rural areas by providing economic, social and physical infrastructure facilities. The mission plans to develop 300 Rurban clusters within the next five years. The National Rurban Mission (NRuM) follows the vision of "developing a village cluster that preserves and nurtures the essence of rural community life and focuses on equity and equality. This is how the "Rurban Villages" cluster is born. National Rural Mission (NRuM) aims to promote basic infrastructure facilities like road, electricity supply, sanitation, health and education facilities are either constructed or upgraded to higher standards under the programme.

▪ SAANSAD ADARSH GRAM YOJANA (SAGY)

The hon'ble prime minister launched the Saansad Adarsh Gram Yojana (SAGY) on 11 October 2014. The goal was to develop three Adarsh Grams by March 2019, of which one was to be achieved by 2016. Thereafter, five such Adarsh Grams (one per year) will be selected and developed by 2024. Inspired by the principles and values of Mahatma Gandhi, the Scheme places equal stress on nurturing values of national pride, patriotism, community spirit, self-confidence and on developing infrastructure. SAGY will keep the soul of rural India alive while providing its people with quality access to basic amenities and opportunities to enable them to shape their own destiny. The main objectives of SAGY are:

Initiate processes leading to comprehensive development of identified Gram Panchayats. To significantly improve the standard of living and the quality of life of all sections of the population through better basic amenities, higher productivity, better human development, better livelihoods, reduction of inequalities, rights and entitlements, wider social mobilization and enriched social capital.

Table : Phase-wise status of identification of GPs under SAGY, based on information available in the SAGY portal as on 21st November, 2022

S.NO.	YEAR	NO. OF SAGY GPS
1	Phase-I (2014-16)	703
2	Phase-II (2016-19)	502
3	Phase-III (2017-19)	303
4	Phase-IV (2019-20)	513
5	Phase-V (2020-21)	340
6	Phase-VI (2021-22)	307
7	Phase-VII (2022-23)	247
8	Phase-VIII (2023-24)	159

▪ SAMPOORNA GRAMEEN ROZGAR YOJANA

Sampoorna Grameen Rozgar Yojana - SGRY was established by the Government of India on April 1, 1989 by merging the Employment Assurance Scheme and the Jawahar Gram Samridhi Yojana which is aligned with the Mahatma Gandhi National Rural Livelihood Guarantee Act 2016. It aims to provide both food and employment to all applicants of rural areas. Poor and economically weaker citizens living in the countryside can apply for wages and food grains. Through this scheme, all the beneficiaries are guaranteed a 100-days employment so that they can live their financial life with ease. To organize the Sampoorna

Grameen Rozgar Yojana 2023, the state government contributes 20% while the remaining 80% is spent by the central government.

▪ **SAMAGRA SIKSHA ABHIYAN**

The Union Budget, 2018-19, has proposed to treat school education holistically without segmentation from pre-nursery to Class 12. It was the initiative of prime minister Atal Bihari Bajpayee, Samagra Shiksha - an overarching programme for the school education sector extending from pre-school to class 12 has been, therefore, prepared with the broader goal of improving school effectiveness measured in terms of equal opportunities for schooling and equitable learning outcomes. It subsumes the three erstwhile Schemes of Sarva Shiksha Abhiyan (SSA), Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and Teacher Education (TE).

It seeks to provide free education to every child of the country in order to fulfill his or her basic fundamental right. The budget of this scheme is shared between state and the central government. Center covers 85% of the expenditure and the state shares 15% of the total, Over Rs. 37,383 crore has been allotted in the budget of 2022 to the scheme.

10.5 PROVISION OF URBAN AMENITIES IN RURAL AREAS (PURA)

PURA was mooted by the former President Dr. Abdul Kalam in January 2003 as a way of empowering and accelerating rural development. The Ministry of Rural Development (MoRD) implemented the PURA scheme on a pilot basis in seven clusters for a period of three years (2004- 05 to 2006-07). PURA 2.0 as a central sector scheme was launched in 2012 focussing on the development of potential growth centres such as census towns. The aim of the program is to provide rural areas with livelihoods and urban services to reduce the rural-urban gap.

The mission of the scheme is a comprehensive and accelerated development of compact areas around the potential growth center of a Gram Panchayat (or group of Gram Panchayats) through a Public Private Partnership (PPP) framework to provide livelihoods and urban services to improve the quality of life in rural areas. The services and economic activities provided by PURA include water and sanitation, construction and maintenance of village streets, drainage, solid waste management, skills development, village street lighting, telecommunications, power generation, village tourism, etc. In 2014-15, the government made no allocation to the PURA scheme and instead introduced the Rurban Mission with an initial allocation of Rs. 100 crore. The aim of the Rurban Mission is to create 300 rural growth clusters across the country.

10.6 SUMMARY

To achieve a sustainable and sustainable development of rural areas, the benefits of growth are distributed to the bottom of society. This is necessary to improve the socio-economic situation of the poor so that they can exercise their basic rights and ensure a decent standard of living. To understand this, however, the starting point of public policy must be an inclusive growth program where differences between economic classes are minimized. Economic development is sustainable if it is inclusive and enables the elimination of poverty and inequality. The aim of the system and programs is to create wage employment, create micro-enterprises, create added value for the inclusion of women through the supply chain, and diversify livelihoods both in the farm and in other sectors, housing facilities with other sanitation services, access to electricity and clean energy, social assistance and better road connections for market access.

Over the years, there has been a paradigm shift in the program's implementation strategy. With the goal of maximum management and a strong interface between the state and the citizen, the government's activities aim at need-based planning, social activities that ensure transparency, and timely delivery of public services. Accordingly, the department has adopted the latest technology to convey the direct benefit of the benefits seeded with Aadhar number. On the other hand, various national rights and entitlements are granted to citizens through public information systems. Thus, the organic relationship between the administrative authorities and the citizens was effective in formulating development plans at the gram panchayat level. The creation of a complaint mechanism allowed citizens to report misuse of public funds and other program conflicts.

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CHAPTER – 11

ORGANIC FARMING FOR ECONOMIC UPLIFMENT OF RURAL INDIANS

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11.1 INTRODUCTION

Use of fertilizers and chemicals in modern agricultural production led to adverse effects on ecology and human health. Water runoffs from farms containing fertilizers pollute surrounding water bodies and soil. These runoffs also pollute the ground water resources which pose a direct threat to domestic consumption. All of this accelerates land degradation and desertification by destroying the natural soil properties. Organic farming is the future. Because it holds answers to many of our questions around development and climate change. Organic farming is a set of agricultural production practices that maintain and enhance the health of ecosystems and soil biodiversity. There are many terms for it, the NITI Aayog prefers calling it 'natural farming', some experts prefer chemical free agriculture and NGOs in the field are excitedly vocal about the term 'zero budget farming'. By default, our country was organic. Then modernization and Green Revolution throttled us into the realm of industrial farming. The shift did help us in achieving food security but took a heavy toll.

Agriculture is a significant contributor to India's economy, providing employment to over 50 per cent of the population and contributing 18 per cent of the country's gross domestic product. However, the farming community in India has long been facing several challenges, including unpredictable weather conditions, high input costs, low yield, and market volatility, leading to low-income levels and poverty. One of the solutions to these challenges is organic farming, a sustainable agricultural practice that utilises natural inputs such as compost, manure, and biological pest. An organic future could be a highly effective solution to feed the increasing world population and a way to achieve more robust food security. Sustainable organic food production methods are reported to produce nutritious foods, preserve biodiversity, and mitigate climate change

Organic farming is the most widely used for increase agricultural production system reliant on green manure, compost, biological pest control, and crop rotation to produce crops, livestock and popularity. Organic cantered agricultural production system fosters the cycling

of the resources to conserve biodiversity and increasing ecological balance. The use of green manure, cover crops, animal manure, and soil rotation, to interrupt the habitation of pests and diseases, improve soil fertility, and maximize the soil's biological activity are the primary aspects of organic farming. In other words synthetic chemicals such as fertilizer, antibiotic, herbicides, or pesticides and harmful are not used in organic farming. organic farming aim at increase agricultural production of fibbers, grains, vegetables, flowers, fruits, foods, and animal products like milk, eggs, and meat is the best natural production..

11.2 NEEDS OF ORGANIC FARMING

Organic farming is most important approaches find out to meet the main object of sustainable agriculture. Many techniques used in organic farming such as inter-cropping, mulching and integration of crops and livestock are not alien to different agriculture systems including the traditional agriculture practiced in old countries like India. However, organic farming is based on different laws and certification programmes, which prohibit the use of almost all synthetic inputs, and health of the soil is recognised as the central theme of the method. Mulching and integration of crop and livestock is not unique to many farming systems including traditional prevalent in an old country like India however organic farming is based on various law and certification programmes that prohibit the use of almost all synthetic inputs.



11.2.1 RELEVENCE OF ORGANIC FARMING

There are three categories of opinions about the relevance of organic farming for India. The first one simply dismisses it as a fad or craze. The second category, which includes many farmers and scientists, opines that there are merits in the organic farming but we should proceed cautiously considering the national needs and conditions in which Indian agriculture functions. They are fully aware of the environmental problems created by the conventional farming. But many of them believe that yields are lower in organic cultivation during the initial period and the cost of labour tends to increase therein. The third one is all for organic farming and advocates its adoption wholeheartedly. They think that tomorrow's ecology is more important than today's conventional farm benefits. However, among many a major

reservation, the profitability of organic farming vis a vis conventional farming, is the crucial one from the point of view of the Indian farmers, particularly the small and marginal. Organic farming involves management of the agro-eco system as autonomous, based on the capacity of the soil in the given local climatic conditions.

In, spite of the ridicule poured out on organic farming by many, it has come to stay and is spreading steadily but slowly all over the world. India has been very slow to adopt it but it has made Inroads into our conventional farming system. One advantage we have here is the fact that the farming techniques practiced in this country before the advent of the green revolution were basically eco-friendly and they have not faded away from the memories of the present elder generation of our farming community. India's options in finding out an alternative method to the conventional farming are limited. The World Trade Organization (WTO) deadline for banning exports of vegetables and horticulture products based on inorganic farming will expire in 2005. Sensing the importance, the Central and state governments have taken several initiatives to popularise organic farming in the country.

11.2.2 REASON OF ORGANIC FARMING

The population of the planet is skyrocketing and providing food for the world is becoming extremely difficult. The need of the hour is sustainable cultivation and production of food for all. The Green Revolution and its chemical-based technology are losing its appeal as dividends are falling and returns are unsustainable. Pollution and climate change are other negative externalities caused by use of fossil fuel-based chemicals. In spite of our diet choices, organic food is the best choice you'll ever make, and this means embracing organic farming methods. Here are the reasons why we need to take up organic farming methods :

- To accrue the benefits of nutrients
 - Stay away from GMOs
 - Natural and better taste
 - Direct support to farming
 - To conserve agricultural diversity
 - To prevent antibiotics, drugs, and hormones in animal products
- Organic farming approach involves steps like, conversion of land from conventional management to organic management and management of the entire surrounding system to ensure biodiversity and sustainability of the system.
- Crop production with the use of alternative sources of nutrients such as crop rotation, residue management, organic manures, and biological inputs.

- Management of weeds and pests by better management practices, physical and cultural means and by biological control system.
- Maintenance of livestock in tandem with organic concept and make them an integral part of the entire system.

11.3 COMPONENTS OF ORGANIC FARMING

Major components of organic farming are crop rotation, maintenance and enhancement of soil fertility through biological nitrogen fixation, addition of organic manure and use of soil microorganisms, crop residues, bio-pesticide, biogas slurry, waste etc. Crop rotation is essential under organic farming system to keep the soil healthy and to maintain the natural microbial systems. The succession of cultivation of different crops on same land is known as crop rotation. The crop rotation cycle should be of 3–4 years.

11.3.1 OBJECTIVE OF ORGANIC FARMING

Organic farming is a system of farming which avoids or largely excludes the use of synthetic inputs and to a large extent relies upon crop rotations, crop residues, animal manures, etc. Its characteristics are: Use of organic materials as pesticides and insecticides, protecting the long-term fertility of the soil. The main objectives of organic farming are responsible use of energy and natural resources. Maintain biodiversity and protect animal welfare. Conserve the regional ecological balance. Some others objectives are

- To Production of high nutritional quality and safe food.
- To work with Natural system
- To encourage and enhance biological cycle
- To maintain genetic biodiversity and protect animal welfare.
- To conserve the regional ecological balance.
- Adequate return
- Satisfaction
- Environmental protection

Organic farming is a production management system excluding of all synthetic off-farm inputs but rely upon on-farm agronomic, biological, and mechanical methods like crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection etc. which promotes and enhances biodiversity, biological cycles, and agro-ecosystem health. As per the definition of the USDA study team on organic farming “organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides,

hormones, feed additives etc.) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection". FAO suggested that "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity, and this is accomplished by using on-farm agronomic, biological, and mechanical methods in exclusion of all synthetic off-farm inputs.

11.4 PRINCIPLES OF ORGANIC FARMING

Organic farming uses green manures, cow dung, organic inputs, etc. It is a system of farming that mainly focuses to keep the soil alive, maintaining its good health, cultivating the land, and raising the crops. This whole thing should be done to maintain a pollution-free environment and in an ecological manner. The Principles of Health, Ecology, Fairness, and care are the roots from which organic agriculture grows and develops. They express the contribution that organic agriculture can make to the world and a vision to improve all agriculture in a global context. An organic future could be a highly effective solution to feed the increasing world population and a way to achieve more robust food security. Sustainable organic food production methods are reported to produce nutritious foods, preserve biodiversity, and mitigate climate change

11.4.1 PRINCIPAL OF HEALTH

Earth is the wholeness and integrity of living systems. Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible. Healthy soils produce healthy crops that foster the health of animals and people. The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings.

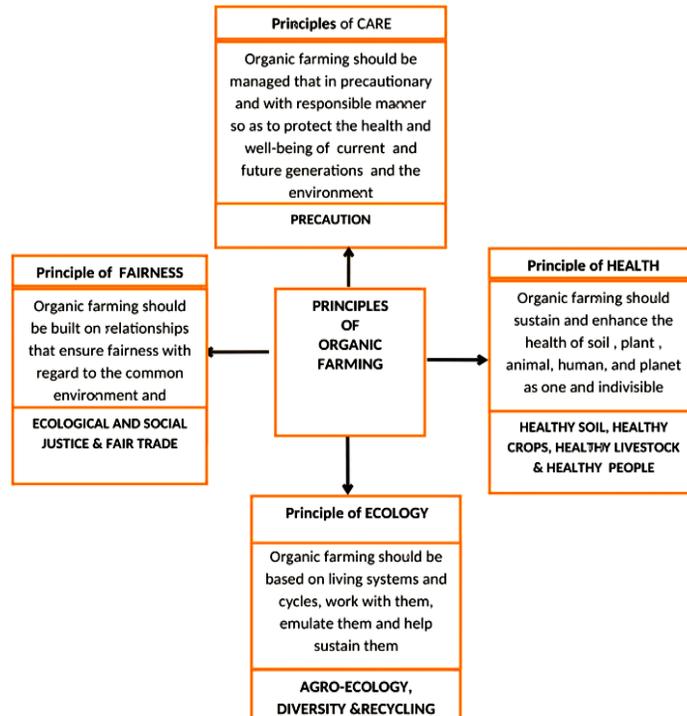
11.4.2 PRINCIPLE OF ECOLOGY

Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them. This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. Organic management must be adapted to local conditions, ecology, culture, and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy to maintain and improve environmental quality and conserve

resources. It should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity.

11.4.3 PRINCIPLE OF FAIRNESS

Organic Agriculture should build on relationships that ensure fairness regarding the common environment and life opportunities. This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties farmers, workers, processors, distributors, traders, and consumers. It aims to produce a sufficient supply of good quality food and other products. Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.



11.4.4 PRINCIPLE OF CARE

Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. This principle states that precaution and responsibility are the key concerns in management, development, and technology choices in organic agriculture.

11.5 ORGANIC FARMING IN INDIA

In India, Organic Farming is not anything new as it has been in practice from ancient times. With the shifting towards minerals-based farming and the chemical and technological advancements made in agriculture in the 1960s, India ushered in an era of Green Revolution.

No doubt, the chemical-based agriculture process paid rich dividends in terms of higher productivity which helped in pulling the country out of food insecurity for the burgeoning Indian population. However, it brought a very negative cascading impact on our ecological plateau, creating new problems like degradation of soil health, emergence of new pests/diseases, wiping out of eco-friendly micro organisms and percolation of toxic chemicals into our food chain threatening the very existence of the biosphere of our nation.

It was, therefore, felt that to sustain agricultural production and productivity and to take this crucial Sector into new frontiers without damaging the resources and the environment, an alternate system of farming is required. In this context, organic farming, focussing on optimal, balanced, efficient and scientific management of land, water, biodiversity and external inputs has emerged as a solution.

11.6 CONCEPT OF ORGANIC FARMING

Organic Farming broadly refers to the farming methods free from toxic pesticides, chemicals and synthetic fertilisers. It stringently follows cultivation methods that keep the soil healthy and avoid adverse impact on environment by using organic waste such as crop, animal and farm wastes including biological materials. According to the Indian Council of Agricultural Research (ICAR), "Organic Agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycle and soil biological activity. This is accomplished by using on farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs". Organic Farming System lays great emphasis on crop rotation, use of crop residues, animal manure and off-farm organic wastes, mineral grade rock additives and biological system of nutrient mobilisation and plant protection techniques for sustaining the fertility of the land under cultivation.

11.7 ORGANIC FARMING : PRESENT SCENARIO IN INDIA

At present, only 1.2 per cent of the world's agricultural land consisting of about 58 million hectares (ha) is considered to be organic. In India, the total area under organic certification is 5.71 million hectares which includes 26 per cent cultivable area with 1.49 million hectares and the rest 74 per cent covering about 4.22 million hectares is forest and wild areas for collection of forest produce. India is the leading organic farm producer, with 8,35,000 farmers out of a total 2.7 million global organic farm producers in 2016.

There was an increase of 7.5 million hectares in organic farmland at the global level in 2016 from 2015 while in India it has increased by 0.3 million hectares over the same period. Total production of organic farm produce and export during 2016-17 is 11,80,105 MT and 3,09,767

MT respectively. Madhya Pradesh has covered the largest area under organic certification with 4,64,859 ha followed by Rajasthan with 1,51,609 ha. Sikkim has the distinction of being a fully organic State with a cultivated area of 56,000 ha.

11.8 MAJOR CHALLENGES FOR THE ORGANIC FARMING SECTOR

Since the organised organic food segment is still at a nascent stage in India, many challenges, affecting their livelihood and income are faced by the organic producers. Some of the major challenges are as follows :

- The transition from conventional to organic farming is accompanied by high input cost and low yield in the initial years. The commercially available bio-manure products may not be completely organic and, therefore, the product sometimes gets disqualified at the certification stage.
- High certification costs, lengthy procedures in the certification process and the inadequate supporting infrastructure for it are major problems the farmers have to contend with.
- Though the Government is subsidising farmers in Participatory Guarantee System (PGS-India), which is a self-certification process, these farmers are not allowed to export their products.
- There are no subsidies from the Government on agriculture inputs for organic farming, specially for the bio-fertilisers and bio-pesticides making the cost of cultivation for organic farming quite high.
- Due to the relatively low volume of organic production, the marketing and distribution chain of organic food products is relatively inefficient and very costly.
- Lack of an organic policy for the domestic markets and products, poses as a big hurdle for the organic sector. In the absence of regulation on labeling standards for organic production and logo, it is impossible to distinguish an organic product from a conventional product. This leads to fraudulent practices causing financial loss to the genuine players who are not getting their fair dues.

To overcome the adverse consequences of chemical-based farming, Government of India has launched the National Project on Organic Farming (NPOF)¹ with an outlay of Rs. 57.05 crores as a Pilot project with effect from 1 January 2004 (Xth Plan) and the same was continued during the XIth Plan with an outlay of Rs. 101 crores. However, later on in the middle of the XIIth Plan period, this scheme was merged with a Central Sector 1 National Project on Organic Farming (NPOF) is a continuing central sector scheme since the 10th Five Year Plan.

Planning Commission approved the scheme as a PILOT project for the remaining two and a half years of the 10th plan period with effect from 01.10.2004 with an outlay of Rs. 57.04 crore. The scheme is continuing in the 12th Plan. NPOF is being implemented by the National Centre of Organic Farming at Ghaziabad and its eight Regional Centres at Bangalore, Bhubaneswar, Panchkula, Ghaziabad, Imphal, Jabalpur, Nagpur and Patna. Scheme the 'National Mission on Sustainable Agriculture (NMSA) with an outlay of Rs. 293 crores for the remaining period of the XIIth Plan.

11.9 MAJOR SCHEMES FOR ORGANIC FARMING

Government has been promoting organic farming across the country through various schemes. Some of the main schemes are as follows:

11.9.1 PARAMPARAGAT KRISHI VIKAS YOJANA (PKVY)

The Parampragat Krishi Vikas Yojana (PKVY), launched in 2015, is the first comprehensive scheme launched by the Central Government as a centrally sponsored programme (CSP), where the Central and State Governments share the funding in varying ratio. It is 100 per cent in the Union Territories, 90:10 in the North-Eastern and Hilly States and 60:40 in the case of the other States. The scheme is implemented by the State Governments. It is implemented on a cluster basis of 20 hectare each.

The farmer within the cluster is given financial assistance upto a maximum of 1 ha and the limit of assistance is Rs. 50,000 per ha during the conversion period of 3 years. The target is to promote 10,000 clusters covering 2 lakh ha over the period of 3 years (2015-16 to 2017-18). In order to implement the PKVY in the 2015-16, 2016-17 and 2017-18 an amount of Rs. 300 crore, Rs. 297 crore and Rs 350 crore respectively has been allocated to the States. Assistance is provided for cluster formation & capacity building, organic inputs, certification, labeling, packaging, transportation and marketing of organic produce. Till now 2,16,560 hectares have been covered under the scheme benefitting 5,41,400 farmers.

PKVY is implemented in a time frame of three years in line with the Participatory Guarantee System (PGS-India) prescribed conversion period of 36 months from conventional farm to organic. Accordingly, PKVY promotes organic farming through a cluster approach to adopt PGS Certification. It facilitates farmers to certify their organic produce, and to label and market their products domestically.

11.9.2 MAIN FEATURES OF THE PKVY

- The cluster chosen for Organic Farming shall be 20 ha or 50 acres in extent and in as contiguous a form as possible.

- Total financial assistance available for a 20 ha or 50 acre cluster shall be a maximum of Rs. 10 lakhs for farmer members and Rs. 4.95 lakh for mobilization and PGS Certification with a subsidy ceiling of one hectare per farmer
- Of the total number of farmers in a cluster, a minimum of 65 percent farmers should be allocated to the small and marginal category.
- At least 30 per cent of the budget allocations need to be earmarked for women beneficiaries/ farmers

11.9.3 MISSION ORGANIC VALUE CHAIN DEVELOPMENT FOR NORTH-EASTERN REGIONS

Realizing the potential of organic farming in the North Eastern Region of the country, Ministry of Agriculture and Farmers Welfare has launched a Central Sector Scheme entitled "Mission Organic Value Chain Development for North Eastern Region" for implementation in Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, during 2015-16 to 2017-18. The scheme aims at the development of certified organic production in a value chain mode to link growers with consumers and to support the development of entire value chain starting from inputs, seeds, certification and creation of facilities for collection, aggregation, processing, marketing and brand building initiatives. The scheme was approved with an outlay of Rs. 400 crore for three years for an area of 50,000 ha to be covered under the Organic Farming in North-Eastern Region. Till June 2017, 2406 Farmer Interest Groups (FIGs) covering an area of 45863 ha and 44604 farmers have been formed. (See Annexure-II)

11.9.4 NEW INITIATIVES

Food Safety and Standard Authority of India (FSSAI) has recently operationalised its regulations on organic food which will regulate the manufacturing, sale, distribution and import of organic food, which will be effective from 1 July 2018. FSSAI has launched an "Indian Organic Integrity Data-Base" to help consumers verify the authenticity of the organic food. It has also introduced a common logo "Jaivik Bharat" for organic food. This would bring more small and marginal farmers under the ambit of certified organic markets.

Organic farming may also hold solution to one of India's largest socioeconomic problem, unemployment. It is more labor intensive. The conversion of degraded land into farms for organic production, using permaculture could provide a good source of green employment in the future.

11.10 WORLD OF ORGANIC AGRICULTURE

Organic agriculture has the potential to contribute significantly to the Indian economy. The sector positively impacts GDP growth, employment generation, and export earnings. It also promotes sustainable development. The agricultural industry contributes around 18% of GDP and employs 50% of the workforce. It has the potential to increase productivity, reduce input costs, improve soil health, provide access to niche markets. In present situation a farmer can earn 45k to 60k per month in one acre land by organic farming. Already we have subhas palenkar method of organic farming. Initial one time investment of 4 lack every month farmer can earn 45k to 60k.

The income from one acre of agricultural land in India can vary depending on a number of factors, such as the type of crop, location, and soil quality. However, on average, farmers can expect to earn between ₹50,000 and ₹100,000 per year. Organic farmers can also add value to their products by processing them into value-added goods such as jams, pickles, and baked goods. These products can be sold at a higher price than raw produce, providing additional income for farmers.

India ranked 8th with respect to the land of organic agriculture and 88th in the ratio of organic crops to agricultural land as per Agricultural and Processed Food Products Export Development Authority and report of Research Institute of Organic Agriculture. In 2018 India had the largest number of organic producers in the world, according to the World of Organic Agriculture Report 2018. With 835,000 certified organic producers in 2018, India had around 30 per cent of total number of organic producers in the world. India is an agriculture-based country with 67% of its population and 55% of manpower depending on farming and related activities. Agriculture fulfils the basic needs of India's fastest-growing population accounted for 30% of total income.

Currently India has 4.43 million organic farmers according to the Economic Survey 2022-23, a significant jump from 2018. The Union Budget 2023-24 aims to help 10 million more farmers to adopt natural farming over the next three years. There are many farmers who are not certified and hence not counted, especially by-default organic farmers in hilly, tribal, and rain-fed regions. About 5.91 million hectares of land in the country are under organic farming, which is around four per cent of the net sown area, according to the Economic Survey 2022-23.

The India organic food market size reached US\$ 1,278 Million in 2022. The International Market Analysis Research and Consulting (IMARC Group) expects the market to reach US\$

4,602 Million by 2028, exhibiting a growth rate (CAGR) of 23.8% during 2023-2028. Farmers bear the brunt of economic exploitation by middlemen and large corporations. The government's minimum support price (MSP) system is often not appropriately implemented, and farmers cannot get fair prices for their produce. As a result, they are forced to take loans from moneylenders at high-interest rates.

This vicious cycle of debt leads to farmers' suicide, poverty, and protests. The Paramparagat Krishi Vikas Yojna (PKVY) promotes cluster-based organic farming with PGS (Participatory Guarantee System) certification. The scheme assists INR 50,000 per hectare for three years, of which 62% is given as an incentive towards organic inputs. Organic farming allows farmers to get better prices for their produce as there is a growing demand for organic products. Organic farming in India is not just restricted to a few certified organic farmers. Many Indian farmers are practising organic methods and, with government efforts, they can now get certification for their organic products.

11.11 ENVIRONMENTAL IMPACT

Organic farming is a set of agricultural production practices that maintain and enhance the health of ecosystems and soil biodiversity. It is done by using diverse species, incorporating crop rotations, and using natural pest management techniques. The use of chemical pesticides and fertilisers is prohibited in organic farming. Organic agriculture helps in reducing greenhouse gas emissions and has a positive impact on climate change. It is estimated that on a global scale, organic farming can benefit biodiversity by ~34% and abundance by ~50%. Organic farming has a protective role to play in environmental conservation. Instead of synthetic inputs, it relies on ecological processes, biodiversity, and cycles adapted to local conditions. This system often integrates three main objectives: environmental health, economic profitability, and social and economic equity.

Organic farming has a protective role in environmental conservation. The effect of organic and conventional agriculture on the environment has been extensively studied. It is believed that organic farming is less harmful to the environment as it does not allow synthetic pesticides, most of which are potentially harmful to water, soil, and local terrestrial and aquatic wildlife. In addition, organic farms are better than conventional farms at sustaining biodiversity, due to practices of crop rotation. Organic farming improves physico-biological properties of soil consisting of more organic matter, biomass, higher enzyme, better soil stability, enhanced water percolation, holding capacities, lesser water, and wind erosion compared to conventionally farming soil. Organic farming uses lesser energy and produces less waste per unit area or per unit yield. In addition, organically managed soils are of greater

quality and water retention capacity, resulting in higher yield in organic farms even during the drought years.

11.12 CONCLUSION

Organic agriculture which emphasises on the sustainable use of locally available natural resources is a holistic food production system. For its sustained growth, ensuring quality, it is imperative for us to adopt a comprehensive approach by taking the support from all stakeholders adopting environment-friendly technologies, providing for marketing infrastructure and effective financial support. As on 31st March 2023 total area under organic certification process (registered under National Programme for Organic Production) is 10.17 mha (2022-23). This includes 5391792.97 ha cultivable area and another 4780130.56 ha for wild harvest collection. India produced around 2.9 Million MT (2022-23) of certified organic products which includes all varieties of food products namely Oil Seeds, fibre, Sugar cane, Cereals & Millets, Cotton, Pulses, Aromatic & Medicinal Plants, Tea, Coffee, Fruits, Spices, Dry Fruits, Vegetables, Processed foods etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. The total volume of export during 2022-23 was 312800.51 MT. The organic food export realization was around INR 5525.18 Crore (708.33 million USD). Organic products are exported to USA, European Union, Canada, Great Britain, Switzerland, Turkey, Australia, Ecuador, Korea Republic, Vietnam, Japan, etc. Organic farming works in harmony with nature rather than against it. This involves using techniques to achieve good crop yields without harming the natural environment or the people who live and work in it. An organic farmer produces vegetables, fruit, cereal crops, or livestock without the use of chemical fertilizers, pesticides or herbicides. An environmentally sustainable system of agriculture like organic agriculture will be able to help maintaining a resource balance, avoiding the over exploitation of resources and conserving the soil nutritional quality and biodiversity in the country.

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