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PANORAMA OF INDIAN TRADITIONAL KNOWLEDGE :
A COMPREHENSIVE EXPLORATION

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DULIAJAN COLLEGE TEACHERS' UNIT
2024-25

EDITORS
MR. PABITRA SONOWAL
DR. KALYANI RAJKUMARI

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Submission Guideline

- The Research Papers or Review Articles or Short Communication must cover the theme "**Panorama of Indian Traditional Knowledge: A Comprehensive Exploration**" and align with the following subthemes.

Subthemes :

- Study on specific Indian traditional practice
- Recent Innovative methods based on traditional knowledge
- Review on Indian traditional knowledge or practices in specific fields
- Scientific basis of specific traditional practices
- Indian Traditional Knowledge and Sustainability
- Interdisciplinary Perspectives on Indian TraditionalWisdom
- Exploring Traditional Indian folklore/Oral traditions in literary narratives
- Exploring Indian Traditional administrative practices
- Assessing Indian Traditional Education system
- Indian Traditional Knowledge and Global Economy
- Protection and Preservation of IndianTraditional Knowledge
- Assessing the value of Indian Traditional Knowledge in the global market
- Scope of Entrepreneurship based on Indian Traditional Knowledge
- Any topic related to the broad theme.

- **Format of the Paper/ Article :**
  - Maximum word limit:For Research paper/ ReviewArticle-3000

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- **Structureof the Paper/Article :**
  - **Title -** Should be informative and precise and typed in Bold, Font size14,Uppercase and Centered
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I/We hereby declare that the paper presented mentioned above is an original work / draft carried out significantly by me/us. Also, the submitted manuscript is not published before and is not under communication elsewhere and if accepted by the Editorial Board of 'Pragyajyoti' and published thereafter, it will not be published elsewhere.

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Editorial

In an era dominated by technological advancement and globalized narratives, traditional knowledge systems often risk being marginalized, viewed as antiquated or irrelevant. However, India's vast and intricate heritage of Indigenous Knowledge Systems (IKS) stands as a testament to sustainable practices, holistic worldviews, and profound scientific insight. These knowledge systems—rooted in philosophy, agriculture, medicine, arts, linguistics, ecology, and spirituality—are more than cultural relics; they are living traditions with potent contemporary relevance.

Traditional Indian Knowledge Systems are not just historical artifacts to be preserved in archives or museums. They are dynamic systems of knowledge that have been shaped by centuries of empirical observation, cultural interaction, and ecological stewardship. As modern societies grapple with issues such as climate change, food security, mental health crises, and unsustainable development, the wisdom embedded in IKS offers alternative paradigms of sustainability, resilience, and wellness.

Take for example Ayurveda and Yoga—two branches of Indian knowledge that have gained global acceptance for their holistic approach to health and wellbeing. Similarly, traditional agricultural practices based on lunar cycles, biodiversity preservation, and natural pest management align closely with current movements toward organic and regenerative farming.

The revival and integration of IKS are no longer optional—they are imperative. This is where the **National Education Policy (NEP) 2020** marks a decisive shift in India's educational vision. NEP places a renewed emphasis on IKS, aiming to bridge the gap between modern scientific education and India's rich intellectual traditions. It promotes the integration of local knowledge into curricula, fostering a sense of pride, cultural rootedness, and contextually relevant learning among students.

While much of the discourse around Indian knowledge systems tends to center around the Vedic and classical traditions of the Indian heartland, it is imperative to acknowledge the unique and vibrant IKS of the Northeastern region. The eight states of the Northeast are not only home to over 200 distinct ethnic communities but also cradle a treasure trove of traditional ecological knowledge, healing practices, linguistic heritage, and cultural expressions.

The indigenous tribes of the region have cultivated intricate knowledge systems surrounding biodiversity, medicinal plants, shifting cultivation (like jhum), and natural resource management. Their understanding of the terrain, weather cycles, and forest ecology is the result of intimate co-existence with nature over generations. For instance, the Apatani tribe of Arunachal Pradesh has been globally recognized for their sustainable agricultural practices combining paddy cultivation with fish farming—an example of efficient resource use and community resilience. Similarly, traditional weaving practices in states like Assam, Manipur, Meghalaya, and Nagaland not only represent aesthetic excellence but are rich in mathematical patterns and cultural symbolism. Folk medicine, practiced by tribal healers using locally available herbs, holds immense potential for research in ethnobotany and pharmacology.

Despite these assets, the IKS of the Northeast remains underrepresented in national discourses. There is an urgent need to document, preserve, and mainstream these knowledge systems through inclusive research, community participation, and integration into the educational and developmental frameworks. The NEP's emphasis on local language instruction, regionally contextualized learning, and knowledge diversity presents an opportunity to uplift these rich traditions and empower their custodians.

To truly honor and harness the potential of Indian Knowledge Systems, we must move beyond tokenism. This involves creating platforms for intergenerational knowledge transfer, incentivizing scholarly research on indigenous practices, supporting community-led documentation initiatives, and ensuring that traditional knowledge holders—especially from tribal and marginalized communities—are recognized and rewarded. Digital technologies can be powerful enablers in this process. Digitizing manuscripts, creating multilingual content, and leveraging AI for knowledge mapping can make IKS more accessible to younger generations. Academic institutions must also foster interdisciplinary studies that link IKS with modern science, thereby dismantling the artificial divide between the two.

It gives us immense pleasure to present the inaugural peer-reviewed edition of *Pragyajyoti*, the ISSN-listed annual journal. This volume is dedicated to the theme, *"Panorama of Indian Traditional Knowledge: A Comprehensive Exploration."* The journal seeks to provide a scholarly platform for critical engagement with the rich and diverse heritage of traditional Indian knowledge systems, encompassing disciplines such as philosophy, science, medicine, art, literature, and culture.

We extend our sincere gratitude to the contributors, reviewers, and editorial board whose rigorous efforts have shaped this edition. We hope that this volume will serve as a valuable resource for academics, researchers, and practitioners engaged in the study and revitalization of indigenous knowledge traditions.

Mr. Pabitra Sonowal
Dr. Kalyani Rajkumari
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CONTENT

Ethnozoological Anti-Malarial Medicines From North East India : A Review

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Abstract :

Traditional medicine plays an important role in health care in both developed and developing countries. Traditional remedies using locally accessible resources have been used for generations to treat and prevent various diseases, especially in underprivileged and rural areas where access to cutting-edge conventional medical care is limited. These treatments are not only easily available and affordable but at the same time are believed to have fewer side effects. Moreover, conventional medicine can also serve as a useful foundation for creating novel pharmaceuticals. Traditional therapies and medications could be incorporated into contemporary healthcare to cure ailments more effectively and affordably while potentially saving lives.

Key words : *Traditional medicine, Indigenous populations, Malaria, Antimalarial drugs, Ethnozoology.*

Introduction :

Malaria continues to pose a major public health threat in India, with the country accounting for a sizable share of cases worldwide. The disease continues to pose a persistent threat despite intensive efforts to curb its spread [1,2]. However, traditional medicinal practices have long been an essential component of malaria treatment in

India, with a wide variety of plant-based remedies being used for many generations to prevent and cure the disease. This review aims to summarize the current knowledge on Ethnozoological anti-malarial medicines of North East India, their potential and conservation status.

1. Overview of Malaria in India

The global tally of malaria cases in 2022 was 249 million, well above the estimated cases before the COVID-19 pandemic and a rise of five million over 2021. India contributes about 66% of malaria cases in the South East Asian Region. India and Indonesia alone accounted for about 94% of all malaria deaths in this region [3,4]. About 95% of the Indian population resides in malaria-endemic areas which includes states like states like Orissa, Jharkhand, Madhya Pradesh, Chhattisgarh and the North Eastern states [5]. People living in forested areas are more susceptible to the disease. Between 2000 and 2019, about 32% of malaria cases and 42% of malaria-related deaths were reported in forested districts of India [6]. The prevalence of malaria among pregnant women in India was found to be 11.4 % of which 10.62% were asymptomatic cases and 13.13% were symptomatic. Pieces of evidence of malarial infection during pregnancy were found in nine very populous states of India including Madhya Pradesh, Tamil Nadu, Rajasthan, Maharashtra, West Bengal, Jharkhand, Chhattisgarh, Andhra Pradesh, and Telangana [7].

The two major species that cause malaria among the population of India are *Plasmodium falciparum* and *P. vivax. P. malariae* and *P. ovale* have also been reported to cause the disease on rare occasions. The malarial parasite is transmitted among humans through anopheline mosquitoes (genus *Anopheles*). There are 444 formally named species of *Anopheles* of which 58 are found in India. Of these, six species viz. *An. culicifacies, An. dirus, An. fluviatilis, An. minimus, An. sundaicus* and *An. stephensi* are considered to be the major malarial vectors [8,9,10].

2. Ethnozoological Anti-Malarial Medicines of North East India

The compilation of knowledge, abilities, and practices that constitute traditional medicine evolved from the theories, and life experiences of various indigenous cultures. The traditional medicine systems of some regions or communities are supported by large volumes of literature and records of the theoretical concepts and practical skills whereas; some other communities verbally pass down this knowledge from generation to generation. About 80% of the population living in developing countries, even in recent times, depend on traditional medicine either by choice or due to a lack of modern healthcare facilities. The most widely used traditional medicine systems include the Chinese, Indian, and African systems. In almost all of these medicine systems, medicinal plants play a major role [11,12]. However, a wide variety of animal/animal products are also used in these traditional medicines, the knowledge of which is conserved by the respective users.

The Indian medicine system includes about 2000 drugs of natural origin, almost all of which are derived from traditional practices. Of these, about 400 are of mineral

and animal origin while the rest are of plant origin. There are three major systems of traditional medicine in India - Ayurveda, Siddha, and Unani [12]. The concepts and practices of these systems are several thousand years old and a large proportion of the Indian population still relies on this traditional medical care. Apart from these three systems, Folk medicine, also known as "tribal" or "indigenous" medicine is also popular in most of the rural/indigenous/ethnic communities. This type of knowledge is usually passed verbally from ancestors to their descendants without any documentation [12,13].

Communities across NE India have a diverse knowledge of plant-based traditional medicine and utilize plants from families like Verbenaceae, Acanthaceae, Asteraceae, Rubiaceae, Rutaceae, Lamiaceae, Euphorbiaceae, etc., for their anti-malarial properties [14-18]. In addition, many indigenous communities of NE India also use traditional animal-based medicines as an alternative to conventional health care systems. Live animals as well as various animal byproducts such as hooves, scales, bones, feathers, tusks, etc. from a wide variety of animals like insects, fishes, reptiles, birds and even mammals have been used as essential ingredients for the preparation of some remedial drugs [19-29]. Table 1 represents a list of some of the animals and their parts used as traditional anti-malarial medicine by different tribes of NE India. Although most of the animals used for this purpose fall under the vulnerable to a critically endangered spectrum of the IUCN status, their scarcity has led to a decline in ethnobiological traditional medicines among the indigenous communities in recent times [19].

Table 1: Details of animals used in the ethno-zoological treatment of Malaria by different communities of NE India :

Animal group	Animal species used	Indigenous community	State	Body parts used	Threat status (IUCN Red List)	Reference
Mammal	*Ursus thibetanus* (Himalayan black bear)	Monpa	Arunachal Pradesh	Gall bladder is dried, powered and immersed in water and the extract obtained is used as therapeutic agent.	VU	[20]
		Tangsa		Uncooked rice is put inside the freshly extracted gall bladder to be smoked and dried for preservation.		[21]

		Ao	Nagaland	Boiled in water anddrunk.		[22]
		Karbi	Assam	Raw bile is consumed.		[23]
			Mizoram	Smoked, Aqueous decoction of gall bladder is consumed.		[24]
Mammal	*Panthera paradus* (Leopard)	Monpa	Arunachal Pradesh	Meat is used as medicine for malaria	VU	[20]
Mammal	*Moschus moschiferus* (Musk deer)	Monpa	Arunachal Pradesh	Musk is used as a therapeutic agent against malaria	EN	[20]
Mammal	*Macaca assamensis* (Assamese macaque)	Monpa	Arunachal Pradesh	Monkey meat is used to treat diseases like malaria	NT	[20]
			Mizoram	Fresh blood is taken orally.		[25]
Mammal	*Trachypithecus pileatus* (Capped langur)	Monpa	Arunachal Pradesh	Meat is used to treat diseases like malaria	VU	[20]
Mammal	*Macaca mulatta* (Rhesus monkey)	Monpa, Adi	Arunachal Pradesh	Meat is used to treat malaria	LC	[20]
Mammal	*Hoolock leuconedys* (Eastern Hoolock Gibbon)	Monpa	Arunachal Pradesh	Meat is used to treat diseases like malaria	VU	[20]
		Tangsa		Flesh, liver and blood are cooked and consumed.		[21]
			Mizoram	Gall bladder- Dried, aqueous decoction is consumed. Raw is also eaten.Blood consumed mixing with alcohol.Liver- Aqueous decoction is consumed		[24]
Mammals	*Vulper bengalensis* (Bengal Fox)	Adi	Arunachal Pradesh	Eggs and adults are used in curing malaria	LC	[25]
Mammal	*Canis aureus* (Golden Jackal)	Biate tribe	Dima Hasao, Assam	Dried Gall bladder is swallowed whole	LC	[26]

Mammal	*Hystrix indica* (Indian porcupine)		Mizoram	Stomach/intestine is boiled in water and administered twice daily for 7 days	LC	[25]
				Smoked gall bladder is consumed. Some mix with water and consume		[24]
		Tangsa tribe, Wancho tribe	Arunachal Pradesh	Gall bladder/bile, Intestine, Stomach, Smoked dried and preserved, consumed whenever required in small amounts by boiling with water		[21]
			Sikkim	The stomach is either sun dried or smoke dried and given for consumption		[27]
Birds	*Falco peregrinus peregrinator* (shahin falcon)	Monpa, Adi	Arunachal Pradesh	Meat is used to treat diseases like malaria	LC	[20]
Birds	*Corvus culminatus* (Jungle crow)	Monpa, Adi	Arunachal Pradesh	Meat is used to treat diseases like malaria	LC	[20]
Reptile	*Melanochelys trijuga*(Turtle)		Mizoram	Cooked meat is taken to cure malarial fever	NT	[25]
Reptile	*Testudo* sp. (Tortoise)	Tangsa tribe	Arunachal Pradesh	A small piece of shell either sun-dried or smoke-dried, crushed and sprinkled on hot charcoal and the emitted smoke is inhaled by covering the head with a piece of cloth	NT	[21]
Reptile	*Daboia russelli* (Viper)		Mizoram	Fatty –oil and Bile used against Malarial fever	LC	[25]
Reptile	*Python molurus* (Python)		Mizoram	Smoked gall bladder is consumed. Sometime aqueous decoction consumed; Raw meat/ smoked meat is used to cure malaria	NT	[24]

Reptile	*Varanus bengalensis* (Monitor lizard)		Mizoram	Meat and skeleton of the lizard mixed together with coconut milk and boiled till the meat is completely dissolved.	LC	[25]
				Smoked gall bladder is consumed. Sometime aqueous decoction consumed		[24]
Fish	*Channa punctatus* (Spotted Snakehead)	Adi	Arunachal Pradesh	Whole fish is given to Malaria patients	LC	[25]
			Manipur	Bile of the fish is taken thrice a day can prevent malaria and taken till recovery		[28]
Fish	*Anabas testudineus* (climbing perch)	Adi	Arunachal Pradesh	Whole fish is given to Malaria patients	LC	[25]
Fish	*Mastacembelus armatus* (Spiny eel)	Tangsa tribe	Arunachal Pradesh	Whole body cooked and consumed for curing malaria	LC	[21]
Annelids	*Pheretima*spp (Earthworm)		Mizoram	Whole body is taken orally or grind and mixed with honey and drink.	DD	[25]
		Wancho tribe	Arunachal Pradesh	Small earthworm found in or on banana plants, vegetables, etc.; consumed in raw form to protect against malaria		[21]
Insect	*Bothroponera rufipes* (Black ant)	Nyishi, Galo	Arunachal Pradesh	Intake of crushed ant along with other edibles during morning hour is considered good for malaria.	DD	[29]
Insect	*Cimex lectularius* (Bed bug)		Mizoram	3-5 bugs inserted into empty capsule and takenorally two to five times to get rid of chronic fever.	DD	[25]
		Biate tribe	Dima Hasao, Assam			[26]

Note: LC: Least Concern; VU: Vulnerable; EN: Endangered; NT: Near Threatened; CR: Critically Endangered; DD: Data Deficient

Discussion :

In North-East India, ethnozoological practices have been an integral part of the region's cultural heritage, with many communities relying on wildlife for food, medicine, and other resources. The ethno-zoological treatment of malaria in different communities of North-East India includes various animals, species, and body parts. Mammals are the most preferred animal group used by the NE Indian tribes, with common species including the Himalayan black bear, Eastern Hoolock Gibbon, and Indian porcupine. In addition, a few species of birds, reptiles, fish, annelids and insects are also used as anti-malarial drugs.

The most documented cases of malaria treated ethnozoologically are from Arunachal Pradesh. *Ursus thibetanus*, often known as the Himalayan black bear, is one of the species that is utilized extensively. Its gall bladder is dried, ground, and mixed in water and the extract obtained is used as a therapeutic agent. Another frequently used mammal is the *Hoolock leuconedys* (Eastern Hoolock Gibbon), which is cooked and consumed for its meat, liver, and blood. The Monpa and Adi tribes of Arunachal Pradesh also utilize the meat of birds like the *Falco peregrinus peregrinator* and the *Corvus culminus*as as a remedy for malaria. The Tangsa tribe of Arunachal has documented the use of dried tortoise carapace as an anti-malarial agent. Fish from the *Channa* and *Anabas* species are used by the Adi tribe to treat malaria. To ward off malaria, the Wancho tribe reported eating raw earthworm species that were discovered in or on vegetables, banana plants, and other plants. Among the Nyishi and Galo tribes of Arunachal Pradesh, eating crushed ants with other delicacies in the morning is said to help prevent malaria.

In Mizoram, different animals are used to manage malarial fever in different ways. Smoked or dried gall bladder, fresh blood, liver, stomach and intestine decoctions are consumed from mammals such as *Hystrix indica*, *Macaca assamensis*, *Hoolock leuconedys* and *Ursus thibetanus*. Additionally, reptiles like *Melanochelys trijuga* (Turtle), *Daboia russelli* (Viper), *Python molurus* (Python) and *Varanus bengalensis* (Monitor lizard) are harvested for their meat, oil, gall bladder, bile and skeleton.

Other northeastern states preferring the use of animal products include Nagaland, Assam, and Sikkim. However, the assessment does point out that there is a dearth of data on traditional anti-malarial treatments based on animals that are utilized by indigenous populations, especially in Assam, Meghalaya, Nagaland, Tripura, and Sikkim. As a result, these findings cannot be considered definitive.

Most of the animals used in these treatment methods fall under the threat status of Vulnerable, Endangered and Near Threatened according to the IUCN Red List. Overhunting and overcollection of wildlife resources for food, medicine, and other uses have caused population decreases and even extinctions. Ethnozoological practices have resulted in habitat degradation and fragmentation, owing to shifting farming

and other human activities. As ecosystems are destroyed and fragmented, confrontations between humans and wildlife grow, resulting in negative consequences for both humans and animals [30].

Conclusion :

With a wealth of knowledge and experience gathered over centuries, traditional anti-malarial medications from northeast India present a viable route for treating and controlling malaria. The effectiveness and potential of these treatments warrant additional study and incorporation into traditional healthcare systems. The government should include the sustainable use of ethnozoological medicines in the current healthcare system in a way that guarantees the successful protection of the species utilized in foods, ethnomedicines, and cultural practices.

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Malaria and Scientific approaches behind its traditional treatment- A Brief Study

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Abstract

Malaria is wide-spread and threatened diseases all over the world. Malaria is generally spread through the bite of female anopheles mosquito. By the process of blood transfusion and by using contaminated needles, malaria cantransferred from one affected human to another normal human. Treatment of malaria is essential to cure the disease from its root. Use of traditional medicines is harmless, affordable and beneficial for health. It is very important to understand the science behind the working principles of all these traditional medicines for future prospective. To manufacture vaccine for malaria treatment, it is very crucial to identify the biology and chemical molecules that may present behind the medicinal plants.

Key Words : Malaria, disease, female anopheles mosquito, blood transfusion, vaccine.

Introduction

Malaria is one of the most dangerous, wide-spread, vulnerable, life threatening disease that cause tremendous death among million of people. Malaria is generally spread through the bite of female anopheles mosquito. By the process of blood

transfusion and by using contaminated needles, malaria can transferred from one affected human to another normal human. Symptoms of malaria are fever, fatigue, vomiting and headache.In human, there are four types of mosquito species that cause the malaria, namely –

1. *Plasmodium falciparum*
2. *Plasmodium vivax*
3. *Plasmodium ovale*
4. *Plasmodium malariae*

All these are intracellular protozoan parasites of genus plasmodium.

Life cycle of malaria parasite :

Malaria parasite maintains its life cycle in the body of female anopheles mosquito itself and in human body. Malaria infection begins when a person is bitten by an infected female *Anopheles* mosquito, injecting *Plasmodium* parasites, in the form of sporozoites, into the bloodstream of human.The sporozoitestravel quickly into the human liver.The sporozoites multiply with asexual reproduction in the liver cells within the next 7 to 10 days, without causing any symptoms. In the form of merozoites, the parasite release from the liver cells in vesicles andtravel through the heart to the capillaries of the lungsand then settles in the lung capillaries. The vesiclesare collapsed byreleasing the merozoites into the bloodstream to develop and multiply in erythrocytes.This cycle happens in repeated manner. Clinical symptoms, including fever, occur in synchrony with the rupture of infected erythrocytes and the release of erythrocyte and parasite debris, including malarial pigment (hemozoin) and glycophosphatidylinositol, (putative malaria toxin). In the infected erythrocyte, presence of HRP-1, EMP-1,HRP-2 and EMP-2 proteins are observed. Among all the infectedmerozoites, some cells instead of replicating asexually develop into sexual forms (gametocytes) thatcirculate in the bloodstream.When a mosquito bites an infected human, it ingests the gametocytes, which develop further into mature sex cells called gametes in the body of female anopheles mosquito. The fertilized female gametes develop into actively moving ookinetesthat actively burrow through the mid-gut wall of the mosquito and form oocysts, inside the oocyst, thousands of active sporozoites develop. The oocyst eventually bursts, releasing sporozoites into the body cavity of mosquito that travel to the mosquito's salivary glands. The cycle of human infection begins again when the mosquito bites another person.

There are some challenges to prevent, diagnosis and treatment of malaria in a population. Some of them are as follows :

1. Resistance of malaria parasite against anti-malarial agents,drugs and chemicals and has probably contributed to the resurgence of infection that increases in malaria-related deaths in recent years.

2. Unavailability of proper instrument, infrastructure and resources for detection and treatment of malaria and its control in developing and underdeveloped countries.
3. Living in unhygienic environment can increase the spreading of malaria parasite.

According to WHO, two approaches are used for controlling, treating and preventing malarial infection, these are:

- To prevent malaria, reduction in human-vector contact and lifespan of mosquitoes by using insecticidal nets, indoor residual spraying and administration of entire course of anti-malarial drugs in the population at high risk in due course of time are very important.
- To cure malaria among population, treatment of affected human being with chemotherapy such as ACTs (artemisinin-based combination therapies) are very essential.

Diet and nutrition can show a major impact to cure malaria disease. Sopatients are advised to follow a nutritionally balanced diet that includes cereals, pulses, vegetables, fruits, milk, milk products, fish, chicken soups, stews, sugar, honey, etc. that provides adequate nutrition and maintains fluid balance which may increase the health of malaria patient.

Objectives of the Study

Analyzing the importance of current issue, the researcher has found out the key objectives in present study as –

- Toanalyze the concept of malaria and it's causing parasite.
- To identify different traditional medicine for curing malaria.
- To examine the scientific reason behind the use of all traditional medicine.

Methodology of the Present Research

As the current work is based on health related issue, the researcher has followed descriptive scientific research method and the data are collected as primary and secondary data collection methods.

Traditional Medicines that are used for the Treatment of Malaria Disease

There are different traditional medicines which may cure malaria without affecting other body organs. Use of traditional medicines is harmless, affordable and beneficial for health. It is very essential to understand the science behind the working principles of all these traditional medicine for future prospective. Some of these medicines are as follows –

Chloroquine : Chloroquine can cause a harmful effect on the parasite and at the end, the death of the malaria parasite may happen. The scientific mechanisms behind the action of chloroquine are –

1. Inhibiting the detoxification of hematin in the malaria parasite's digestive vacuole.
2. Chloroquine inhibits the action heme polymerase in malaria to prevent the conversion of heme to hemozoin.
3. Chloroquineintercalates into DNA to disrupt the replication, transcription and translation of paracite's DNA.

Artemisinin **:** It is a widely used anti-malarial drug which is generally obtained from the sweet herb wormwood and used as a first-line treatment against Plasmodium parasite. The scientific mechanisms behind the action of artemisinin are –

1. Its chemical structure that is tetracyclic 1,2,4-trioxane.
2. Artemisinin inhibits nucleic acid and protein synthesis in malaria parasite.
3. Artimisin inhibits heme polymerization to destabilise the protein synthesis in parasite's membrame.

Quinine **:** Quinine is an alkaloid derived from the bark of cinchona tree. It has been used as an antimalarial drug since long period of time. Quinine affects the malaria during its asexual stage of lifespan.Scientific approachesbehind the working mechanism of quinine are –

1. Drugs interfere with the parasite's ability to break down and digest hemoglobin.

Acanthospermumhispidum **:** A. hispidumis an annual plant in the family Asteraceae.A. hispidum show antibacterial and antifungal properties. It is traditionally used for the treatment of malaria, jaundice, vomiting skin aliments cough, cephalgias, abdominal pain, convulsions, stomachache, constipation, eruptive fever, snake bite, epilepsy, skin ailments, cough, bronchitis, and blennorrhoea and bronchitis. It is also used as an antifeedant. Scientific mechanisms behind the action of A. hispidum are –

1. A. hispidum appears to contain phytoconstituents that may be useful adjuvant for antibiotic formulations.
2. This plant also contains sesquiterpene lactones of the germacranolide group.
3. It also contains tannins, glycosides, sugars, alkaloids and saponins. Anti-inflammatory properties have also been shown, which helps treat malaria.

Carpolobia**lutea :** Carpolobialutea shows various medicinal properties against diarrheal, ulcer and malaria. A clinical study on mice examined that a 2450 mg/kg dose was safe for traditional use against malaria. Scientific mechanisms behind the use of C lutea are **–**

1. C. lutea contains some molecules in different parts of its body axis; some of these chemical molecules are like triterpenicsaponins (roots), tannins, anthraquinones, cardiotonic glycosides and alkaloids. These molecules can kill the malaria parasite.

Future Prospectives

Now days, people want to going back to their ancient life style for solving different health related issues. Traditional medicines have great value in today's time and traditional medicines are affordable also. By looking all these aspects, it is very easy to say that all these medicinal plants have so much future prospective.

Conclusion

Malaria is one of the most threatened diseases all over the world. To develop malaria vaccine with affordable price, it is very essential to know the chemical formulas and biology. Traditional medicines and their scientific formulas are very important and helpful to develop vaccine for malaria.

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Traditional Agroforestry System : A Study on Jorhat District, Assam

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Abstract

India is a country where the rural agrarian communities are majorly dependent on agriculture for livelihood. Each community has traditionally developed their own methods of agricultural practices and prepared the tools on the basis of the available resources, socio- economic condition and geoecological setup of the region. Traditional agroforestry systems are human-managed land-use system in which woody perennials are intentionally grown in association with agricultural crops, pastures as well as livestock. Different agroforestry has traditionally been practiced by different communities in India. These practices are closely related to the associated physical environment and the socio- economic status of the area and are truly based on the farmer's experience. These traditional agroforestry systems have different environmental and economic benefits. In the Jorhat district of Assam, there are also some traditionally managed prevalent agroforestry systems. Spatial variation in these systems have also been noticed in in the study area. The paper tries to identify the available traditional agroforestry systems of the study area and classify them. The probable benefits of these systems have been tried to estimated.

Key Words: Traditional Agriculture, Agroforestry, Agriculture Land- management, Jorhat.

Introduction

Every region and every community have their own traditional agricultural methods, traditions and practices (Hamadani, *et. al.*, 122). India is a country where the rural

agrarian communities are majorly dependent on agriculture for livelihood. Each community has traditionally developed their own methods of agricultural practices and prepared the tools on the basis of the available resources, socio- economic condition and geoecological setup of the region. Therefore, the traditional agricultural practices are closely linked with the surrounding environment (Altieri and Koohafkan, 63). These practices and beliefs have been transferred from one generation to the other. Certain temporal and spatial changes can be noticed in such practices. Traditional agricultural practices are engaged with tilling, sowing, harvesting and other agricultural land management practices. These practices can be termed as sustainable agricultural practices as the materials used are bio degradable and based on local available resources, less costly, easily understandable and acceptable by the local people, environment friendly and helpful for waste management (Bernues, et. al, 135). Traditional agroforestry is one of the common traditional agricultural practices (Hamadani, et. al., 119). There is many traditionally practiced agroforestry systems in different parts of Assam. These agroforestry systems are considered the environment friendly and sustainable agricultural practices.

The traditional agroforestry is a traditionally practiced agriculture land management system, where the beneficial trees are planted along with the crops and rear the livestock simultaneously (Viswanath and Lubina, 96). The planted trees are usually fruits or wood producing trees (Levasseur and Olivier, 279). Agroforestry system have social, economic and environmental benefits. It is very beneficial for biodiversity conservation in local level (Chitapur, et. al, 930). In different parts of Assam, many agroforestry systems have been identified (Ulman, et.al., 415). The very commonly seen agroforestry system in the study area is the home garden. In the study area too some common traditional agroforestry systems have been noticed. Agroforestry system has many social, environmental and economic benefits. Agroforestry system helps in better land utilization, soil conservation, maintenance of soil organic carbon (Rao, et. al, 28; Fahad, et.al., 2022) and useful for maintaining micro- ecosystem conservation and overall improvement of the ecosystem in a sustainable way (Raj, et.al, 579). At the same time there are many economic benefits of this system. It helps the farmer in getting the needed food, fuel wood, fodder, timber, spices etc. easily from their own (Jaha, et.al, 22-23). It helps farmers during the days of crop failure (Jemal, et.al, 2017). Agroforestry system helps farmer to increase farm income (Tiwari, et.al, 301) and helps in sustaining the agriculture (Awazi, et.al., 381). Agroforestry is also helpful in maintaining social sustainability. The traditional agroforestry system has been practiced by the farmers from ages, therefore it is easy to adapt such practices for the society intensively. It promotes the health and living standard of society by providing diverse ecological system.

In the study area there are still some prevalent traditionally managed agroforestry systems. The present study tries to identify the agroforestry systems of the area and their respective significance. The study also attempts to analyze the community development bloc wise variation and prevalence of these practices.

Study Area

The present study is carried out in the Jorhat district of Assam. The administrative boundary of Jorhat district was newly demarcated in 2016, by excluding the former Majuli subdivision in the north. The geographical extension of newly demarcated Jorhat district is 93° 56' 24'' E to 94° 38' 24'' E longitude and from 26° 18' 36'' E to 26° 58' 48'' E latitude (Fig. 1). About 80% of the total geographical area of Jorhat is classified as rural area with 598 numbers of villages and 99% of the total population (Census of India, 2011). The rural economy of the Jorhat district is majorly dependent on agricultural activities. About 46% of the total population is directly or indirectly dependent on agricultural activities for their livelihood (Census of India, 2011). The district has diverse geoecological and socio- economic characteristics. In the northern part the area is formed by the newer fluvial deposits of the Brahmaputra River and it's tributaries and the Naga-Patkai hill range of Nagaland covers the district along the northern part. In the district there are many Scheduled Tribe and Sc communities live and their main livelihood is agriculture. Though modern agricultural methods and techniques have been adopted in different parts of the district, the farmers still follow some significant traditional agricultural practices. These practices can be seen along different communities in the area and are connected with the surrounding geoecological condition. These traditional methods re related to agricultural land management practices, sowing, tilling, harvesting, pest management, fertilization etc.

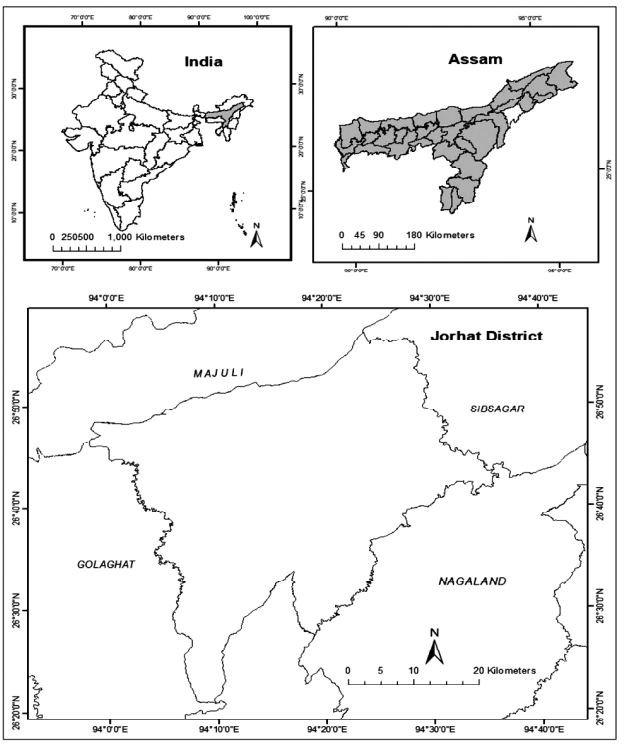

Figure 1: Location Map of Jorhat District

Database and Methodology

The present study primarily based on the empirical observation, information collected through interview and focused group discussion. Primary survey has been carried out in the district during 2022-23. Sample villages are selected from each Community Development Blocks. 4% villages from each CBD were selected by using stratified sampling method considering the factors like number of cultivators, nearness to town, geo- ecological condition, transportation facility etc. from each selected villages, 10-12% of the households are selected randomly and from each household two members are selected to fill one interview schedule. The collected information has been cross-checked by conducting focused group discussion comprising farmers from different socio-economic backgrounds. Field visit have been done throughout the year for the empirical observation. The classification and relevance of the documented traditional agroforestry systems, is done on the basis of extensive literature review. The collected data are analysed by adopting qualitative approach.

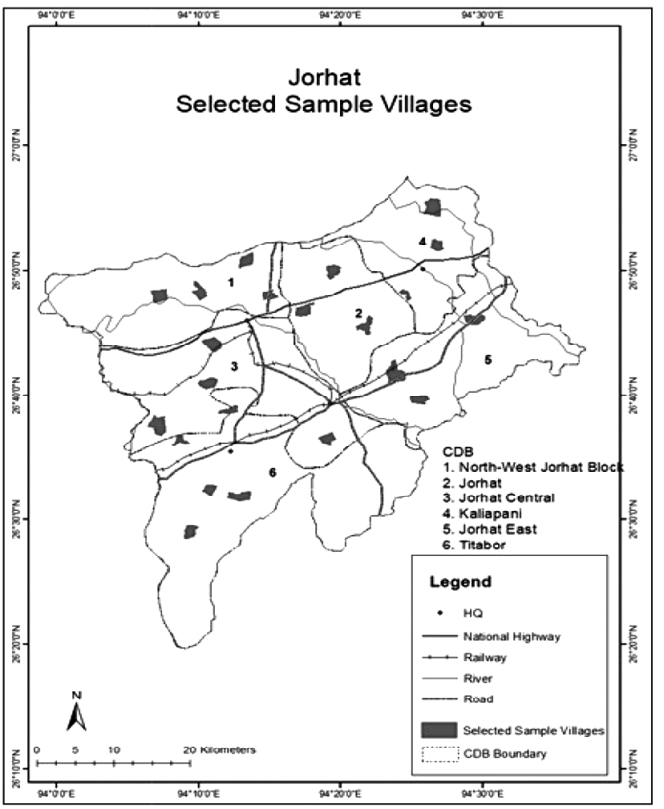

Figure 2: Location of Selected Sample Villages

Result and Discussion

Identified Traditional Agroforestry Systems in the Study Area

In the study area there are different agroforestry system, which have been developed traditionally in accordance with the concerned ceosystem. Agroforestry system is mainly visible in the areas of Mariani and Titabor than in the northern plain area. As the southern area is not suitable for field crops, therefor home gardens with different crop/ plant combination are noticed. In the northern parts Aquaforestry is commonly seen. Overall in almost every household some kind og agroforestry can be seen in the area. The prominent traditional agroforestry system of the study area are mentioned in the table 1.

Table 1 : Identified Traditional Agroforestry System in the Study Area

Sl. No.	Agroforestry System	Combination	Prominent Areas	Identified Households (in %)
1	Commercial crop and Planted Tree	Tea+ Betelnut Tea+ Betelnut+ Black Paper Tea+ Sal Tree	Southern Villages bounded by Reserve forests Villages of Titabor Block	35%
2	Aqua- forestry	Pond+ Arecanut/Banana Tree on boundary Pond (with fish) + Bamboo Tree on boundary	Visible in majority villages of northern plain area and Titabor Block	45.7%
3	Home Garden/ Bari	Betelnut+ Black Paper Betelnut+ Betel Leaves Betelnut+ Black Paper+ Assam Lemon	Mostly seen in Mariani and Titabor Area	43.3%
4	Multiple Fruit Plant	Mango Tree+ Jack Fruit Tree + Betel Nut	Majority area	64.6%
5	Barrier Trees around Crop Fields	Crop Field+ Big Trees/ Bamboos on boundary	Whole study area	100%

Source : Field Survey, 2022-23

i. *Commercial crop and Planted Tree :* In the southern villages of Mariani and Titabor, people plant commercial crop (Tea) in their home garden. Along with tea plantation, they plant shaded trees like Betel Nut and *Sal Trees*. Some people plant parasites, like Blak Paper and Betel leaves to climb at these shaded trees. Three main sub systems are identified under this category: a) Tea with Betelnut,

b) Tea with Betelnut and Black Paper, c) Tea with *Sal tree* (Fig. 3). This type of agroforestry is majorly seen along the southern areas nearby hilly and forest cover zone of East Jorhat CDB, Titabor CDB and Jorhat CDB. About 35% of the household has this type of agroforestry system in the district. In these parts due to animal aggression and pest attack, people face problems in growing of other food and fiber crops. The planted trees help in providing shade to tea and at the same time produce wood, nuts, spices, betel leaves. (fig. 3)

Figure 3 : Commercial crop and Planted tree with a) Tea+ Betelnut
b) Tea+ Betelnut+ Black Paper

ii. *Aquaforestry:* In many rural households a pond with serrounding trees is commonly seen in the study area. Banana, Betelnut, Bamboo trees etc. are planted, serrounding the pond. Beside the production of fruits, nuts and bamboo; these palants helps in maintaining the ecosystem of the pond. Traditionally these ponds are dug in the backyard of the houses for the purpose of drinking, bathing, washing and giving water to the vegetable gardens, rearing fish, ducks etc. Currently, the water of the ponds are not been used for drinking, bathing etc. as there are different sources of pure drinking water. Currently the households use the pond to rear fishes, ducks etc. Two systems of aqua- forestry are indentified in the region: a) Pond+ Arecanut/Banana Tree along the bank and b) Pond (with fish) + Bamboo Tree along the bank. This type of agroforestry system basically seen in the northern lowland ares of North-west Jorhat CDB, Kaliapani CDB abd northern Titabor CDB. About 45.7% householda of the district has this type of agroforestry system. (fig. 4)

iii. *Home Garden/ Bari:* In the backyard of the households, the uninhavitted area is usually used for planting different trees. The big trees are planted along the boundary. These big trees are supposed prevent wind speed along with production of fruits. In local term these homestead gardens are termed as *bari.* These bari portions are abondond area of the households. The identified home gardens are a) Betelnut+ Black Paper, b) Betelnut+ Betel Leaves, c) Betelnut+

Black Paper+ Assam Lemon. This type of baris is identified in 43.3% of the total households of the district. The majority of betelnut gardens are identified in the Mariani and Titabor region of the district. (fig. 5)

Figure 4 : Aquaforestry a)Pond + Arecanut/Banana Tree on boundary
b)Pond (with fish) + Bamboo Tree on boundary

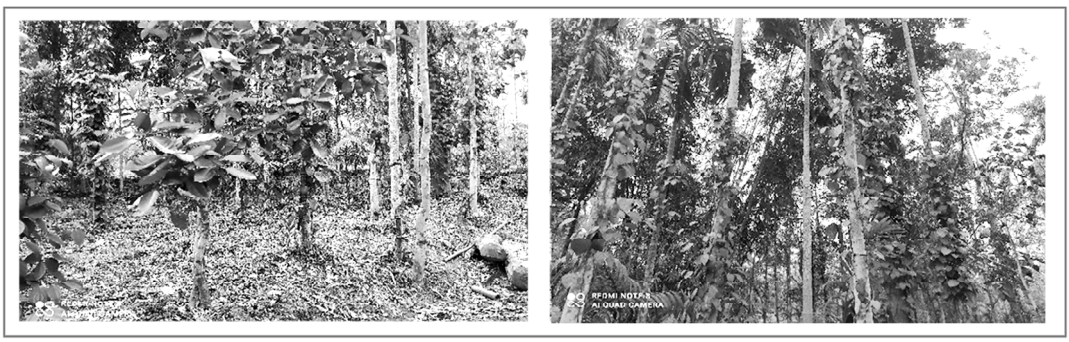

Figure 5: Home Garden/ *Bari* a) Betelnut + Black Paper/ Betel Leaves Plant
b) Betelnut+ Black Paper + Assam Lemon

iv. *Multiple Fruit & Nut Plant:* In the study area, some households having large campus, they plant fruit plants like Mango, Jack Fruit, Indian gooseberry, Olive trees etc. in their home garden along with betel nut. The idea behind was to use the uninhabited area to be self sufficient for seasonal fruits. Majority household of each CDB has this type of agroforety system. In the whole district about 64.6% of the total households practice this agroforestry system. (fig. 6)

v. *Barrier Trees around Crop Fields:* Around the paddy fields of the study area, big trees or bamboo trees are Planted. In some places couple of trees are planted in between the crop fields. The barrier trees are helpful in preventing high speed storms and can minimize crop damage up to certain extent. The planted trees helps in maintinind the ecosystem by providing shelter to birds and other pollinators, which inturn helps in crop pollination. In the study area almost every paddy field have this kind of barrier trees. (fig. 7)

Figure 6: Multiple Fruit & Nut Plant

Figure 7: Barrier Trees around Crop Fields

Conclusion

The traditional agroforestry system is beneficial for sustainable land management and rural economy. It has multiple environmental benefits too. These traditional agroforestry systems have developed on the basis of the age-old experience of the farmers and have been handed over from generation to generation. The importance of these agroforestry systems in the rural agricultural economy can not be overlooked. In the study area the identified agroforestry system are mainly concentrated in the rural areas and due to changes in the land-use and land-cover. Adoption of other agricultural practices have also brought challenges in the adoption of these traditional agroforestry system. The identified agroforestry system of the study area can be studied further by the agriculture scientists for further modification to get more profit. These agroforestry can help the farmers in emergency and can provide additional financial benefit by the production of food and fodder. The identified agroforestry in the study area has numerous benefits regarding economic and social. syatems can also be adopted in the other similar physiographic regions.

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Traditional Therapeutic Uses of Copper

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Abstract

Copper is an essential trace metal for the human body. It plays vital roles in many physiological functions of the body like regulation of heart rate and blood pressure, activation of immune system, development and maintenance of bones and connecting tissues. Ancient Ayurvedic practitioners used copper vessels for preparation of different drug formulations due to its sterile property. Recent researches have shown that copper surfaces have antimicrobial activity against microbes such as *Escherichia coli, Staphylococcusaureus*,influenza virus and fungi. Ayurvedic practitioner since the *Samhita* period used copper based drugs for the treatment of wounds and different ailments of liver, spleen and heart along with abdominal pain, anaemia, tumours, tuberculosis, etc. "*Tamra Bhasma*" is one of such popular drug used in traditional Ayurveda, used for treatment of ulcers, haemarrhoids, skin disorder, dyspnoea etc. It is in fact a powder of copper nano-oxide made edible and compatible to the human body.

Keywords : Copper, Ayurveda, Antimicrobial, *Tamra Bhasma*, Nano-oxide.

Introduction :

Ayurveda and the use of metals :

The ancient Indian medicinal knowledge and well-being practices, popularly known as "Ayurveda", was established on the idea that mental, physical, and spiritual wellness are interdependent and require careful balance. Various factors, including as stress, a poor diet, and environmental pollutants, can upset this balance. According to Ayurveda,

"vata", *"pitta"*, and *"kapha"* are the three *"doshas"*. *"Doshas"* are biological energy of the body or the regulating forces of nature. *"Vata"* is the principle of movement. It is responsible for the nervous system, creating and all kinds of movement in the body. "Pitta" is the principle of metabolism. It governs digestion and body temperature and helps keep a clear mind. *"Kapha"* is the principle of body structure. It provides the body with firmness and stability and helps maintain the body's fluid balance. These *"doshas"* or energies must be in balance for optimal health because they are in charge of the body's upkeep and growth.

The history of Ayurveda can be divided into three distinct periods depending on the predominance of the system of management of health and disease, *viz. Vaidika* period, *Samhita* period and *post-Samhita* period. Ayurveda formed a substantial part of of *Atharvaveda* of the *Vaidika* period. In this period emphasis was given on strengthening and maintenance of health through management of healthy life style. The *Samhita* period scholars expanded their vision to pharmacotherapeutics exploring the medicinal properties of plant, animal products and minerals. Although more emphasis was given to the use of plant based drugs due to their easy assimilation in the human body, but at several times minerals were also used in combination with plants forming herbo-mineral drugs. The use of independent mineral drugs was also not uncommon. Metals and metallic minerals were vigorously processed to make it physically soft, edible, assimilable and compatible with human body. Gradually, a new class of drugs termed as *"Rasaushadhi"* with a new science termed as *"Rasashaastra"* appeared in Ayurvedic system.[1]

Ayurveda endorses the use of metals such as gold, silver and copper for purification of water. The therapeutic properties of metals such as gold, silver, copper, iron, lead, tin and bronze metal are described in *Samhita* period literature.[1] Copper was one of the earliest metals to be used by mankind and it is considered sacred in many cultures. It is an important component in Ayurvedic medicine. The use of copper water or copper infused water has long since been practiced by our ancestors following ayurvedic principles and is still prevalent in many households.[2] Copper has antibacterial qualities and consuming water stored in a copper vessel for eight hours is believed to have a cooling effect on the body along with multiple benefits balancing the three *doshas* in our body. According to Ayurveda, copper has properties that aids in the process of peristalsis, that is the movement of food through the food canal and removes the undigested or poorly digested food particles from the walls of the small intestine and improves nutrients absorption and digestion of food. These undigested foods according to Ayurveda are the toxins and are responsible for all the diseases. Copper charged water has additional properties that induces fat loss. With such historic background, copper has found its way into the water purification industry. Drinking water stored in a copper bottle overnight is the very first step of the Ayurvedic morning routine which plays a very important role in keeping healthy and preventing diseases. This helps to

flush out all the toxins from the intestines which prevents many diseases. [1] Traditionally, Indian homes stored drinking water in copper and silver pots. When water is stored overnight in copper, small amounts of ions dissolve into the water and destroys microorgan-isms through a process known as oligodynamic effect. The oligodynamic effect is a biocidal effect of metals, especially heavy metals, that occurs even in low concentrations. This effect is attributed to the higher affinity of cellular protein for metallic ions. The microbes absorb the metal ions which damage their cell membranes. The cumulative effect of the ions within the microbial cells causes them to die even if the concentration of ions in the solution is negligible.[3]

The use of copper as antimicrobial medicine spread worldwide in the 19th and 20th centuries. A variety of inorganic copper preparations were used to treat diseases like eczema, impetigo, scrofulous, tubercular infections, syphilis etc. These treatments continued until the emergence of commercial antibiotics in the year 1932.[4]. Modern medical research continues to investigate the use of copper in medicine and its therapeutic benefits. Ancient societies had a very different concept of health and illness and they clearly believed that copper possessed therapeutic characteristics. This ancient wisdom is now supported by modern medical research which has helped to understand these qualities better. According to some recent studies, copper as a matter of fact have a variety of health advantages. These include its potential to aid in wound healing, antibacterial, and anti-inflammatory qualities.[5] Studies have also shown that copper have antioxidant qualities that help protects cells from damage caused by free radicals. Copper has also been explored and utilised as an antibacterial agent in wound dressings. Another way to benefit from the healing properties of copper is to wear copper bracelets. The use of copper bracelets is a traditional practice in many cultures, and many people believe that copper ions can be absorbed through the skin, providing many health benefits. Copper's therapeutic benefits have gained widespread recognition, it is still employed in a number of medical procedures.[1]

Importance of copper in human body :

Copper is a toxic but an essential trace element for the survival of living organisms. Today more than 50 types of copper containing proteins are known like lysol oxidase, tyrosinase,cytochrome c oxidase etc.[4] It is present in all tissues of the human body and is known to play a role in the production of red blood cells, the regulation of heart rate and blood pressure, the absorption of iron, the prevention of prostatitis or inflammation of the prostate, the development and maintenance of bones, connective tissues and organs such as the heart and the activation of the immune system.[6] It binds to ceruloplasmin, albumin and other proteins with significant biochemical functions. It is necessary for the production of energy, increasing the number of red blood cells and the development of brain and heart tissue. Lack of copper can lead to many health problems such as anaemia, osteoporosis, etc.[7]

Copper infused water is believed to be antibacterial in nature and has many health benefits such as better digestion, boosting immunity and curing arthritis. Copper makes the water alkaline, which helps maintain the body's pH balance. But in the modern world, metal utensils have been replaced by plastic and steel utensils which have caused many diseases and lifestyle abnormalities in the human body.[8]

Copper is an essential trace mineral that is vital for physical and mental health. But due to widespread occurrence of copper in our food, hot water pipes, medicinal tablets etc, the chances of copper toxicity increases. Copper may not be poisonous in its metallic state, but some of its salts such as copper sulphate in higher doses acts as a poison causing gastric and intestinal irritation. Copper is a powerful inhibitor of enzymes. It is needed by the body for several functions, mainly as a cofactor for a number of enzymes such as ceruloplasmin, cytochrome c oxidase, dopamine β-hydroxylase, superoxide dismutase and tyrosinase. It is present in several haematinics and its salts are also used therapeutically because of their astringent and antiseptic properties. But, sometimes copper salts are poisonous for human organ system. Copper toxicity occurswhen retention of copper occurs in the kidneys. Copper first start to deposit in the liver and disrupts its ability to detoxify elevated levels of copper in the body. This adversely affects the nervous system, reproductive system, adrenal functions, connective tissues etc. Toxic amounts of copper can leach into foods that has been cooked in unlined copper cookware. Such corroded cookware create reactive salts which are often poisonous like blue vitriol (copper sulphate), verdigris (copper sub-acetate). These salts when consumed in large amounts causes severe vomiting, abdominal pain, headaches and can even cause convulsion or paralysis. [9]

The role of copper complexes in medicines is not always straight forward and their role largely remains underestimated. Copper in food is processed by the liver and is transported and concealed in a safe manner. Inorganic copper mainly derived from drinking water or supplements mostly bypasses the liver and enters the free copper pool of the blood directly. This copper is potentially toxic as it can pass through the blood-brain barrier. About 50% of the daily dietary copper intake which is about 1-1.5 mg is absorbed by the stomach and small intestine. This is transported to liver bound to albumin and to the peripheral tissues bound to ceruloplasmin. Copper is incorporated into several metalloenzymes involved in haemoglobin formation, carbohydrate metabolism, biosynthesis of catecholamine, antioxidant defines mechanisms and cross-linking of collagen, elastins and hair keratin. The copper containing enzymes like cytochrome c oxidase, superoxide dismutase, ferroxidases, monoamine oxidase etc helps to reduce reactive oxygen species in the body. Copper deficiency in humans is rare but its deficiency may lead to normocytic, hypochromic anemia, leukopenia and osteoporosis. [6,7,9] Copper is crucial element for brain development during fetal and post-natal growth and maintenance of brain health including effective anti-oxidative defences throughout life. Copper plays important roles to communicate between nerve

and cells, maintain healthy skin and connective tissues and to heal wounds. It is essential for structural integrity and function of heart and blood vessels and growth of new blood vessels. Copper helps to maintain proper structure and function of circulating blood cells and formation of the new blood cells of our immune system for maintaining a healthy and effective immune system. It is also useful for generation and storage of energy in mitochondria-the power houses of our cells.[6]

Antimicrobial properties of Copper :

Bacteria, yeast, fungi and viruses are rapidly killed on metallic copper surfaces. This process is termed "contact killing".[4] Modern studies confirm that copper is a naturally hygienic metal that slows down the growth of germs such as *Escherichia coli, Mycobacterium tuberculosis*, methicillin resistant *Staphylococcusaureus (MRSA), Clostridiumdifficile*, influenza A virus, adenovirus,and fungi. [8,10,11,12] Copper alloy surfaces are sterile and have intrinsic properties to destroy a wide range of microorganisms. That is why ancient Ayurveda practitioners used copper vessels for the preparation of different drug formulation for both external as well as internal use.[13] The U.S. Environmental Protection agency has also registered copper as the first solid microbial material. The process of contact killing of microbes was believed to proceed by successive membrane damage, copper influx into the cells, oxidative damage and DNA damage followed by cell death.[4]

Influenza A is a viral pathogen that causes significant mortality and morbidity, in the elderly and in high-risk groups. Influenza easily spreads through direct or indirect contact with respiratory secretions when contacting surfaces contaminated with the influenza virus. This virus can survive on a variety of environmental surfaces, including stainless steel. A recent study suggested the application of copper-based surfaces to reduce the transmission of influenza A virus, where rapid inactivation occurs after 6 hours. [14] Other studies have confirmed the antimicrobial properties of copper against many pathogenic bacteria, including *Escherichia coli* O157, *Salmonella enterica, Campylobacter jejuni, Staphylococcus aureus,* etc. [2,8,10,11,12] After surfaces have been contaminated, fingers can transfer viral particles to up to seven other clean surfaces, suggesting that materials with innate antiviral properties may act to prevent further contamination. The mechanism of reduced infectivity after exposure to copper is not clearly known. The redox properties of copper, which generates hydroxyl radicals is believed to cause cellular damage in microbes. Another route of copper ion toxicity was suggested to be the displacement of iron from iron-sulphur clusters and zinc from important binding sites of proteins.[4] Test results with methicillin-resistant *Staphylococcus aureus* suggest that copper ions have the ability to disrupt DNA by binding and cross-linking between and within the strands. Viral replication may also have inhibited by copper-related RNA-negative genome damage of the influenza A virus.[14]

The spread of pathogenic microorganisms cannot be achieved by one single way. With the emergence of potentially pandemic viral strains like SARS COV, requires the highest level of hygiene control, which needs multi-barrier protection. Simply replacing steel appliances with copper does not prevent the transmission of influenza. However, studies showed that copper surfaces can contribute to the number of control barriers capable of reducing virus transmission, especially in environments such as schools and health care units, where viral contamination can cause serious infections. The best approach to controlling the flu is to prevent the infection itself through excellent hygiene standards and vaccination programs.[14]

Copper nanoparticles : "Tamra Bhasma" in Ayurveda

According to Ayurveda, *"bhasmas"* are drugs based on metal or metal oxides. Metals and metal oxides gained the true status of drugs in the field of medicine during the *'Samhita'* age of Ayurveda. A complex and elaborate procedure for the preparation of bhasma was described by sage *Nagarjuna* around 800 AD in *Rasashaastra*. According to Ayurvedic metallurgy, bhasma is product of herbo-metallic product and contains both metallic and herbal ingredients. It is basically a calcined form of metals or minerals treated with herbs. This process has been meticulously followed even today. *Bhasmas* were believed to be more efficacious than any other healing system in ancient India. These *bhasma's* are infact nanomedicines with nanosized (10^{-9} m) particles. They are more biocompatible as compared to any chemically produced entity because they are insoluble and can absorb and enter into the blood stream very easily due to its size to volume ratio. *Bhasmas* as compared to their herbal drug counterparts are stable over a longer period of time, require lower doses, are easy to store with sustainable availability.[15] Currently, there is an urgent need for the practitioners of modern and traditional systems to standardize the synthesis procedure, rigorous scientific analysis for the quality, safety of these metal-based bhasma's. One of the widely used metal oxide based Ayurvedic drug is *Tamra Bhasma* derived from metallic copper. It is recommended for different ailments of liver and spleen, dropsy, abdominal pain, heart disease, colitis, tumors, anemia, loss of appetite, tuberculosis, as well as eye problems. The ancient Egyptian medical texts mentions the use of copper for the purpose of sterilizing chest wounds, which provide evidences of first use of copper as healing drug. The Greeks, Romans and Aztecs also used copper or copper compounds for the treatment of headaches, burns, intestinal worms, ear infections and for general hygiene. [4] Inorganic methods of copper synthesis have been found to be effective in treatment of eczema, impetigo and tuberculosis infections.

Copper and its salts are also known to produce gastric intolerance. That is why *Ayurvedic* practitionersused copper in "bhasma" form and as a part in compound formulations termed as *"Yoga"*. The prescribed dose of bhasma ranged from 15 to 60 mg with different adjuvants termed as *"Anupana"*. The most commonly used *anupana* or

adjuvant was honey, followed by zinger juice, cow ghee, beetle leaf, pepper powder, sugar and warm water. Importance of these specific adjuvants, especially honey and ghee, is that they enhance the potency of the ingredients as well as facilitate their journey to the intended destination due to their carrier property. In some formulation *Tamra* has been used indirectly in a form of preparation medium or in form of vessel for the preparation of some formulations where *Tamra Bhasma* are not directly used. Often pestle made from *Tamra* is used for grinding and mixing of the formulations.[6] Several synthesis techniques have been employed to prepare these metal oxide nanoparticles. These techniques play a vital role in giving the uniqueness to the final nanoparticle and thereby influencing its medicinal properties [16]. The classical texts of *Ayurveda* and *Siddha* says that it is the distinctive methods of preparations which gives significance to the metal oxide nanodrugs [17]. The preparation method of these herbo-metallic oxide nanoparticles involve complex and repetitive processing steps of annealing, detoxification, and calcination.[5] It is believed that during the synthesis process, the metals from their raw state, in combination with the herbs, get converted to their respective oxides, which eliminates the metal toxicity and provides medicinal properties.[17]

Copper oxide nanostructures finds multiple applications in the field of biomedicine. It is found to exhibit anticancer, wound healing, antibacterial properties, anti-inflammatory and antitumor property.[18], There are also reports of the usage of purified form of copper oxide in the treatment and management of obesity, tuberculosis, cough, asthma, skin diseases, and obesity [19]. Copper nano-oxides have been used as coating in metallic dental implants along with several other biomedical applications. *"Thamira parpam"* is a copper containing herbo-metallic oxide nanocomplex. It is known as *"Gunma kalan"* in *Siddha* literature and has been in human use since ancient times for the management of ulcers. [5].

Tamra (copper) is one of such metals which are being used in therapeutics in different forms since centuries. *Tamra Bhasma* has been used in the Indian system of medicine for the treatment of different ailments like peptic ulcer (*Parinamashula*), anaemia (*Pandu*), abdominal pain (*Udara shoola*), haemarrhoids (*Arsha*), skin disorder (*Kushtha*), dyspnoea (*Shwasa*) etc.[20] Copper is the ingredient of many profusely used herbo-mineral formulations like *Arogyavardhini Vati, Hridayarnava Rasa, Panchamrita Parpatietc.*[6] The use of Tamra is described in *Shuddha Dhatu Varga* used by *Rasavaidyas* in therapeutics since *Samhita* period. In this period, it was used in the form of simple powder (*bhasma*) with nopharmaceutical processing. After 10th Century A.D., during the post-Samhitaperiod, different texts of *Rasashaastra* describes the use of Tamra systematically in the form of its types, preparative methods (*Grahyagrahytva, Shodhana, Marana*), pharmacological actions, therapeutic uses etc. Since then *Tamra* is a well known material, successfully used to treat various diseases in the form of *Bhasma* as single or compound preparation with other herbo-mineral drugs. [13]

Metallic preparations being highly efficacious in small doses and having long shelf life, was very popular among Ayurvedic physicians. Modern research on *Tamra Bhasma* have confirmed its efficacy for anti-ulcerogenic, anti-oxidant, anti-hyperlipidemic activities. Toxicity studies of *Tamra Bhasma* have also proved to be safe at the therapeutic drug dose level. Each and every ingredient in the formulation has its own specific role in the body. Exploring the role of Tamra Bhasma in particular formulation in a specific disease conditions can provide guidelines for renewed research in Ayurveda. [13]

A research work carried out in 2017 by R.K. Singh and coworkers[21], reported the preparation of nano-crystalline *Tamra Bhasma* by incineration of pulverised copper wire in an electrical muffle furnace and studied on the physical properties of Ayurvedic nano-crystalline *Tamra Bhasma* with X-ray diffraction analysis, scanning electron microscopy, UV-IR, photoluminescence and magnetometry studies. The XRD results showed that *Tamra Bhasma* has nanocrystalline nature with size less than 100 nm. The SEM micrograph also revealedthat they formed micrometer samples due to agloromation of nanocrystallites. FTIR results indicated that different crystalline oxides and salts of Cu were present in the prepared bhasma. VSM measurement revealed super-paramagnetic nature of the *bhasma* that supports its medicinal value. The antimicrobial study showed effectiveness on both gram positive and gram negative bacteria and was useful in controlling bacterial infections.

In another work, S. Ophale and his team 2022 [22], prepared *Tamra Bhasma* and studied the pre-clinical efficacy of the the drugs on the liver function tests of Wister albino rats. They prepared the *bhasma* by two methods, viz- indirect heat by using sunlight method called *Aputi Tamra Bhasma* and by direct heating method called *Puti Tamra Bhasma*.These drugs were used in elevated Bilirubin and elevated SGOT(serum glutamic-oxaloacetic transaminase) levels in rats. As per results, *Puti Tamra Bhasma* is more effective for elevated bilirubin and *Aputi Tamra Bhasma* for elevated SGOT. Both the drugs were found to be safer for liver functions. No physiological or adverse behavioural change was seen in the rats. Histopathological reports of the kidney for both the drugs also showed normal echo texture.

An analysis of recent literature made by M. J. Wozniak-Budych [23] explored several aspects of the prospects and challengesassociated with copper-based nanomaterials. Biocompatibility of such materials remains a constraint for their conversion from the laboratory to the clinic. Innovative solutions are required to ensure the smoothblending into the human body. Precise design and careful engineering is required to achieve the controlled release of therapeutic agents from copper nanoparticles. In a recent review by I. A. Ivanova and coworkers [24], analysed the application of copper ions and nanoparticles as broad-spectrum antimicrobials. Copper nanoparticles were presented as an alternative to rising antibiotic resistance with basic mechanisms for antimicrobial resistance.

Conclusion :

Billions of people around the globe lack access to safe drinking water and many children die of basic hygiene and water related diseases such as cholera and diarrhoea every year.[8] The public water distribution systems in most developing countries are poorly maintained. Moreover, unsafe storage and handling practices often results in recontamination of drinking water. It is therefore important to develop effective strategies that are acceptable and affordable to the general people and can be implemented at a domestic level. The merits of copper surfaces for their use in improving public hygiene in healthcare facilities and for the purification of drinking water have been highlighted in several studies. As such, copper holds potential to provide a viable and cheaper alternative to provide microbial-safe drinking water to the rural masses in developing countries.

Copper has been utilised for healing and good health for a very long time dating back to the ancient times of the Egyptians and Ayurveda. Its usage by ancient societies was not just based on customs but also on their knowledge of it's therapeutic powers. Copper pots have been used since ages in Indian households and is also socially very acceptable to the people. Copper pots are simply a passive storage of water and does not need power, fuel, filters or sunlight to operate or maintaining the benefits that can be achieved by using copper pots for water sanitisation outweighs its costs.[2] It is important to note that more research is needed to fully understand the extent of copper's potential health benefits. The risk of toxicity from copper is also minimised when used appropriately and under the guidance of a healthcare professional.

Contemporary medical research has opened up new avenues for potential uses of copper. Copper is a beneficial addition to one's health prescription due to its possible health advantages. Copper's value in traditional medicine is evident from its continued use in health and wellness. But, it is also important to consult with a healthcare professional before using any form of alternative medicine. In todays era of modern medicine, it seems difficult to accept the fact that ancient Indian knowledge and medicine system understood the significance of certain metals in the body and turned these otherwise poisonous metals into human assimilable forms. In the last decades, serious doubts rose on safety and efficacy of these herbo-metallo-mineral formulations. The efficacy of these drugs change with the minor changes in the methods of preparation, ingredients etc. The number of expert practitioners have dwindled and those who are prescribing these formulations don't have the sufficient knowledge regarding the method of preparation, dose, appropriate adjuvant, specific and other indications of the formulation etc. As a result, this field has suffered major setbacks. To overcome this degrading situation, systemic and conceptual research in the field of synthesis and uses of these formulations is highly essential. [13]

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Vedic Multipliers in Digital Circuits : A Short Review

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Abstract

The utilization of Vedic multipliers in digital circuits is growing in popularity due to their efficiency. This article provides a review of the Vedic Multipliers based on the *Urdhva Tiryakbhyam (UT) Sutra* from Vedic mathematics. Additionally, the article provides an overview of the diverse application areas where Vedic multipliers are used. By exploring the potential aspects of using Vedic multipliers leading to a technological shift in digital circuits, this review article offers valuable insights into the possibilities of future high speed digital circuit applications.

Keywords: *Digital Signal Processing, Multipliers, Urdhva Tiryakbhyam, Vedic Mathematics, Vedic Multipliers.*

Introduction

Binary addition and binary multiplication are crucial operations for high performance digital computing systems [1]. The multiplier units are the fundamental and most frequently used units of the digital signal processing systems. High operating speed, low power consumption, and design regularity in less area are some of the basic requirements for the VLSI implementation of these devices [2, 3]. The Vedic mathematics-based multiplier designs have shown excellent speed, small size, and power-efficient operations because of their simple and regular architecture [4]. Vedic multiplication minimizes signal propagation time and increases circuit efficiency by concurrently generating partial products and their sums.

The *Urdhva Tiryakbhyam (UT) Sutra* is the most preferred multiplication technique in Vedic mathematics among all the Sutras. This is explained by the *UT sutra's* universal applicability and use of both vertical and transverse multiplication. This article discusses the basics of the *Urdhva Tiryakbhyam (UT) Sutra* and the design of Vedic multipliers based on it. Additionally, this article also discusses the application of the UT based Vedic multipliers in various domains such as arithmetic computing circuits and digital signal processing circuits.

Basics of Urdhva Tiryakbhyam Sutra

Vedic mathematics is an ancient Indian mathematical system that employs sixteen principles known as *'Sutra's* [4]. These principles have effective applications in various mathematical specialties as well as diverse technological domains. The Table-1 presents the categorization of Vedic *sutras* relevant to different areas of mathematics [4]. A significant number of published works appears to employ the *Urdhva Tiryakbhyam (UT) Sutra* among the several *Sutras* in Vedic mathematics. Since the UT sutra can be applied in every situation and utilizes both vertical and transverse multiplication, UT Sutra is the most recommended method for multiplication in Vedic mathematics. The words *Urdhva* meaning vertically and *Tiryakbhyam* meaning crosswise, the term *Urdhva Tiryakbhyam* means Vertically and crosswise.

Table-1: Categorization of Application of Vedic Mathematic Sutras

Sl. no.	Name of Sutras	Meaning of the name	Application
1	*Urdhva Tiryakbhyam*	Vertically and crosswise	Multiplication and Division
2	*Yaavadunam*	Whatever the extent to fits deficiency	Multiplication and Division
3	*Nikhilam Navatashcaramam Dashatah*	All from 9 and the last from 10	Multiplication and Division
4	*Ekadhikina Purvena*	By one more than the previous one	Multiplication and Division
5	*Ekanyunena Purvena*	By one less than the previous one	Multiplication and Division
6	*Paraavartya Yojayet*	Transpose and adjust	Multiplication and Division
7	Puranapuranabhyam	By the completion or non-completion	Addition
8	*Vyashtisamanstih*	Part and Whole	Fatorization
9	*Shesanyankena Charamena*	The remainders by the last digit	Fatorization
10	*Gunitasamuchyah*	The product of the sum is equal to the sum of the product	Fatorization

11	Gunakasamuchyah	The factors of the sum is equal to the sum of the factors	Fatorization
12	Chalana-Kalanabyham	Differences and Similarities	Fatorization/algebra related
13	Sopaantyadvayamantyam	The ultimate and twice the penultimate	Algebra related
14	Shunyam Saamyasamuccaye	When the sum is the same that sum is zero	Algebra related
15	Sankalana-vyavakalanabhyam	By addition and by subtraction	Algebra related
16	Anurupye Shunyamanyat	If one is in ratio, the other is zero	Algebra related

The basic steps of the multiplication for two digit numbers are illustrated in the following example [4]. Let us perform multiplication of the two digit numbers 43 and 75. The multiplication process of the two numbers using the UT method is illustrated in the Figure-1. The multiplication can be described by the following three steps [4]-

- Step 1(Vertical multiplication): Multiply the LSBs 3 and 5 (outcome=15), place the LSB of outcome 5 as result and MSB 1 as carry.

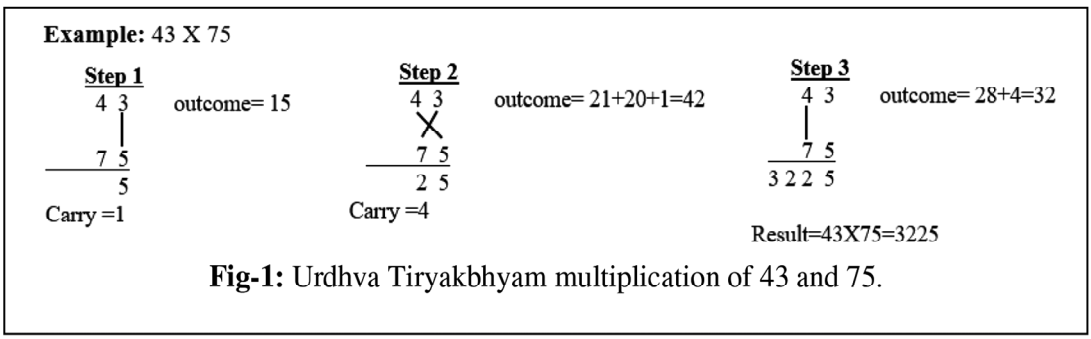

Fig-1: Urdhva Tiryakbhyam multiplication of 43 and 75.

- Step 2 (Crosswise multiplication): Multiply LSB of one number with MSB of the other, add the two products terms (21 and 20) as well as the carry from step 1. LSB of the outcome (42) is the middle term of final result whereas the MSB of outcome will be the carry for step 3.
- Step 3 (Vertical multiplication): Multiply the MSBs of the two terms and add the product (28) with the carry generated from step 2. Place the outcome (32) as result.

The UT method can be applied to larger numbers following a similar procedure. The Figure-2 illustrates the multiplication of the four digit numbers 4356 and 7219 by the UT method, yielding the result 31445964 [4].

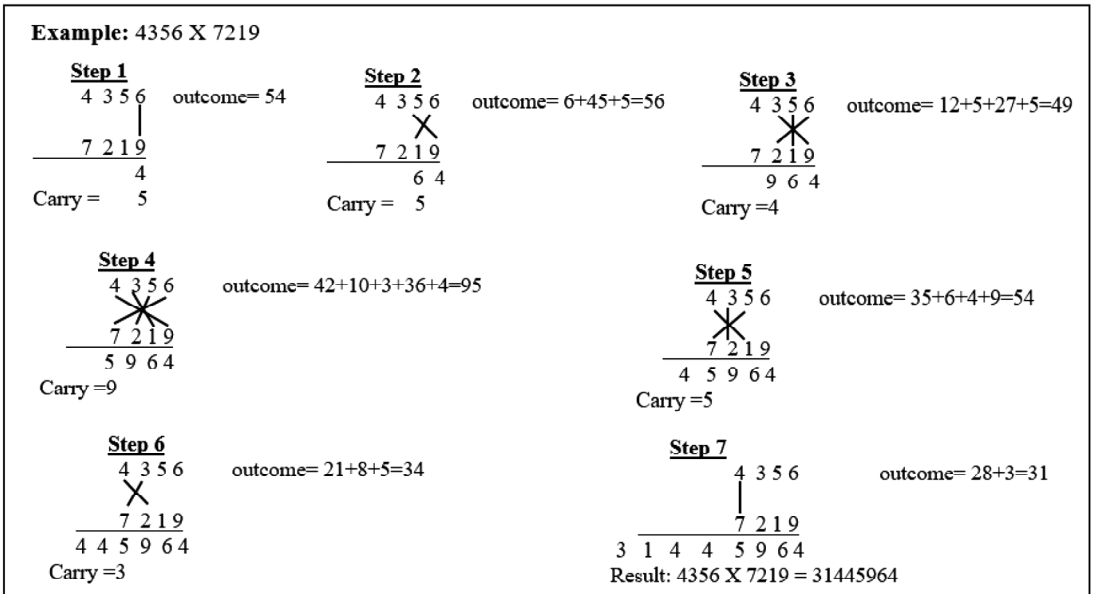

Fig-2: Urdhva Tiryakbhyam multiplication of 4356 and 7219.

Vedic Multipliers Based on Urdhva Tiryakbhyam Sutra

The implementation of the Vedic multiplier is based on the basic UT multiplication rules discussed above. The Figure-3 shows the logic circuit of a basic 2-bit Vedic multiplier used for multiplication of two binary numbers having LSB L_1 and L_2 and MSB M_1 and M_2 respectively [5]. The output of the multiplication is the number Q having the bits Q_0 (LSB), Q_1, Q_2 and Q_3 (MSB). Thus, a 4-bit binary product can be obtained from the multiplication of two 2-bit binary numbers.

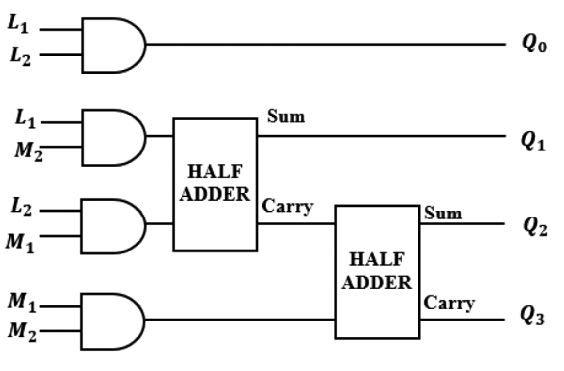

Fig.-3: Logic circuit of a basic 2-bit Vedic multiplier with two binary inputs having LSB L_1 and L_2 and MSB M_1 and M_2.

The design an UT based n-bit Vedic multiplier can be achieved by employing four $\frac{n}{2}$-bit multipliers arranged in an optimized manner, along with a number of adders upto n-bits [5]. The output of such a multiplication yields a 2n-bit binary number. For example, the design of 4-bit multiplier is an arrangement of 2-bit multipliers and 4-bit binary adders along with OR gate and half adders, giving rise to an 8-bit output.

The operating speed of the n-bit Vedic Multiplier is not significantly impacted despite the use of multiple logic components due to the concurrent operation of those components. Furthermore, in comparison to other existing multiplier circuits, such a Vedic multiplier produces fewer partial products and hence requires fewer additions, resulting in a higher operating speed and greater efficiency than other conventional multipliers.

A comprehensive literature review indicates that the UT-based Vedic Multipliers are 0.74 times, 0.5 times and 0.62 times more compact and 1.03 times, 1.19 times and 1.14 times faster compared to previously reported array amplifiers, booth amplifiers and Wallace amplifiers respectively [6-9]. Furthermore, UT-based Vedic multipliers are found to exhibit 0.54, 0.8, and 0.49 times lower power consumption as well as 0.61, 0.49, and 0.45 times lower propagation delay in comparison to array amplifiers, booth amplifiers, and Wallace amplifiers, respectively [6-9].

The overall efficiency of a Vedic multiplier is dependent on a few key performance factors namely delay, physical dimensions, power consumption and quantum cost. In view of these parameters, Vedic Multipliers are typically implemented using three main technological approaches- CMOS based software implementations [10-12], QCA based software implementations [13-15], and HDL languages based hardware implementations [16-18]. A comprehensive review of the literature on Vedic multipliers reveals a paradigm shift in technological methods from traditional CMOS technology to new and innovative QCA technology. Due to its benefits such as smaller device size, reduced power consumption, and higher operating speed, QCA technology has emerged as a potential alternative to the CMOS technology as the key technology to implement Vedic multipliers.

Apart from the UT sutra, Vedic Multipliers are also designed using other Vedic Sutra's such as *Yaavadunam Sutra* (meaning- Whatever the extent to fits deficiency), *Ekanyunena Purvena sutra* (meaning- By one less than the previous one), *Ekadhikena Purvena sutra* (meaning- By one more than the previous one), *Nikhilam Navatashcaramam Dashatah sutra* (meaning- All from 9 and the last from 10), etc. whereas, the *Paraavartya Yojayet sutra* (meaning- transpose and adjust) has been employed for the design of divider circuits. However, aside from UT sutra, every other sutra is a particular multiplication technique, and are only applicable when the numbers meet specific requirements. The *Nikhilam Sutra*, for instance, requires that at least one operand be close to the power of 10, *Ekanyunena Purvena* is only useful when the multiplier contains just nines as digits, etc. Due to their universal applicability, the UT sutra is the most popular multiplication technique employed in the implementation of Vedic multipliers for use in diverse technological fields. Nevertheless, Vedic multipliers based on other Vedic multiplication sutras are also utilized in certain regions that satisfy their specifications and are found to be just as efficient as UT-based Vedic multipliers.

Application of Vedic Multipliers

Vedic multipliers have the innate capacity to minimize propagation delay and area, which makes them ideal for circuits involving multiplication operations in many different fields. Vedic Multipliers play a vital role in the design of high-speed arithmetic processor circuits. Vedic Multipliers are used as the basic multiplication blocks of some basic arithmetic processor components such as ALUs [19,20], MACs [21,22], ASICs [23,24] etc. Due to their highly efficient operation, many reported works use Vedic multipliers as the basic multiplication unit of such devices.

Additionally, Vedic Multipliers are widely used in many different fields such as Digital Signal Processing (DSP) [25,26], Biomedical Signal Processing [24,27,28], Digital Image Processing [29,30], Cryptography [31,32] etc. as well as for high performance computing, neural networks and communication systems. Radar signal processing, image and video compression, speech recognition, and audio and video processing are a few notable DSP applications of Vedic Multipliers. Vedic multipliers in biomedical signal processing are used to improve the speed and precision in the analysis of ECG, EEG, and medical imaging data. Vedic Multipliers are effectively employed in Digital Image Processing to improve the compression ratio as well as image quality of the image processing algorithms such as DWT, JPEG etc. Vedic multipliers are also employed to accelerate numerous high performance computing operations (viz., weather forecasting, various scientific simulations, etc). The application of Vedic multipliers to communication systems is useful in a number of areas, including error correction codes, channel encoding/decoding, digital modulations as well as many other tasks employed in wireless communication. Vedic Multipliers are used in cryptography and security systems for efficient implementation of encryption/decryption algorithms, digital signal schemes, hash functions etc.

Conclusion

This article presents an overview of the basic design of Vedic multipliers based on *Urdhva Tiryakbhyam (UT) Sutra* from Vedic Mathematics. It is evident that the Vedic multipliers provide excellent speed, small size, and power-efficient operations making it a potential candidate in improving the performance in a wide range of applications across several fields. The article also demonstrates the usefulness and versatility of Vedic multipliers in a variety of domains, underscoring their effectiveness and possible influence on improving computational performance and efficiency in a range of applications. Overall, the article offers an in-depth analysis of the current status of the study regarding Vedic multipliers and opening the door for additional research and development in this domain.

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A Review of Ancient India's Traditional Water Harvesting Systems

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Abstract :

India is a land of traditional scientific knowledge. In ancient times traditional techniques of water harvesting and conservation were used to meet the needs the community. These systems were not only environment friendly and sustainable but were cheap, reliable and efficient that catered to the climate and topology of a particular region. Archeological marvels like Surangama, Eri, Madaka in the south; Phad, Virdas, Nala bandha, Tank, Step well, Johad in the west; Naula, Gul, Kul and Zing in the north; Kund, Ahar Pyne, Bamboo drip irrigation, Apatani, Dongs, Garh and Zabo in the east are proof of rich heritage of India's water harvesting systems. Case studies show that these traditional water harvesting systems combined with modern technology can rejuvenate India's depleted water resources.

Keywords : *Traditional, Harvesting, Rainwater, Community, Irrigation*

Introduction :

In ancient India water bodies were revered as Gods. Holy rivers as the Saraswati, Ganges, Yamuna, Krishna, Kaveri, Narmada and Brahmaputra were mentioned in Rigveda. The Vedas mentioned that water and the Universe are of the same age. Along with being divine and worshipped, through Puranas, Vedic, Jain, Buddhist texts, Ramayana, Mahabharata, Ramayana it could be understood that ancient India understood the importance of water harvesting and collection through canals, tanks, wells and embankments [1]. The geographical diversity of India ensured varied and

unique structures for water harvesting and conservation. Many existing archeological sites, dilapidated ruins are proof of such systems. However, with time the use of traditional techniques of water harvesting has declined. The inception of British rule of Indian subcontinent in 1850s expedited the decline of the traditional knowledge and practice of water harvesting methods. The British policies of centralized revenue collection system played a decisive part in the demise of the traditional water harvesting systems [1]. With the economic exploitation of the village communities, the vital link between nature and humans was snapped [2, 3]. Additionally, in recent times too, the neglect of policy makers towards existing traditional structures, lack of community participation led to the decline of traditional techniques of water harvesting.

On the basis of the UN-Water report 2024, it is said that around 720 million people i.e. 10% of the global population approximately suffered with critical levels of water availability and quality in 2021 [4]. The 2017 report of NITI Aayog states that India is one of the most water deficient regions in the world having only 4% of overall water resources available in the world [5]. Millions lack access to safe drinking water. Indian agriculture being still dependent on rainfall, a bad monsoon drastically affects the national economy. Rising temperatures with climate change, increasing consumption, rapid urbanization, industrialization, pollution and excessive ground water extraction is further deteriorating the quality and quantity of fresh water. Immediate and collective action is necessary to stop this impending doom. The Indian Government has thus started promoting water conservation among local communities, seeking sustainable solutions to water conservation and developing necessary infrastructures in order to mitigate this problem. One of the best possible ways is to redevelop and reincorporate traditional water harvesting systems of ancient India [6]. These systems are simple, environment friendly, efficient and unique to every region's geography and culture.

Traditional Water Harvesting Systems :

Ancient India showcased a deep knowledge of climate, topology, engineering and technology through their water harvesting structures [6, 7, 8, 9]. The ancient Indian text Ramayana mentioned two lakes: Panchapsarotataka and Pamasaras [9]. Proof of dams built with stones dating back to the 3rd millennium B.C. were found in Baluchistan and Kutch. The Indus-Saraswati civilization of 3000 to 1500 B.C showed proofs of existing reservoirs to store rainwater. Proof of the earliest tanks were found in the excavations of Harappa and Mohenjodaro civilizations [9]. Chandragupta Maurya's dynasty in 321-291 B.C. showed evidence of dams, lakes and irrigation systems. The Chalukya dynasty's rule in the 12 century is considered the golden age for tanks. Several structures like lakes, tanks and canals were built during this period [1, 9].

The design, structure and engineering of the water harvesting systems depended on the terrain and climate of a specific region as well as on whether they were used for drinking water or for irrigation purposes [1]. Based on this we mention below the various ancient Indian water harvesting systems.

- **Surangam**, **Karambu :** These two systems were widely used in Kerala. Water is diverted away from a well with the help of a tunnel or surangam, then collected and stored at the mouth of the surangam with the help of a reservoir. Karambus are temporary dams stretching across the mouth of channels. These karambus boost the water level within the canals as well as divert that water into nearby fields also [6, 7, 8, 9, 10, 11].
- **Eri** : Some 1500 years ago i.e. during 6th to 10th century, Eris were developed in Oorani, Tamil Nadu. It is constructed with a large number of tanks that restores the ground water table as well as provide for drinking water and irrigation. Eris formed a very rich water harvesting system of Tamilnadu. Community participation was ensured for the maintenance of the Eris [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Madakas, Neeruganti :** Used in Karnataka, India these are naturally occurring depressions. Rain water is diverted using gravity into these depressions. The water from these guts is then distributed for various purposes [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Cheruvu :** Local to Andhra Pradesh, a tank or a small pond is called a cheruvu. It is used to store and conserve rain water runoff [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Bhandara Phad Irrigation, Ramtek** : Bhandaras originated in the Ramtek town of Maharastra. Bhandaras are check dams constructed over river or streams. These check dams increase the level of the water in the river. This water is then directed using an extensive network of tanks and polis for irrigation purposes [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Katas, Mundas, Bandhas :** Katas are triangular or rectangular check dams built to block off a region on a large field and collect water. This water is then used for irrigation purposes. These structures are mainly found in Madhya Pradesh and Orissa [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Virdas :** These are small, shallow pools constructed at the foothills of hills or mountains mostly prevalent in Kutch area of Gujarat. These structures capture and store runoff from monsoon rains which are then used in the dry months. The size and depth of these structures depends upon on the landscape they are built on [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Naada/Bandha :** These are check dams built across a stream with stones and found mainly in the Mewar, Thar Desert. This check dams capture rain water runoff in the monsoons and the resulting silt deposits on around these check dams makes the land fertile [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Johads** : Johads are mainly found in Rajasthan. They are made of stone and mud and act as obstacles that helps arrest rain water going down the slopes. This allows rain water to perlocate the ground and recharge the ground water table. Johads are used for irrigation purposes [6, 7, 8, 9, 12, 13, 14, 15, 16].

- **Talabs** : They are naturally occuring depressions/pond/lakes or can be man-made. Narrow streams are used to collect rain water from various directions. Talabs can store large quantities of water for various purposes like drinking, in household works, in temples and for tourism. The oldest talab in Rajasthan is said to be the Ranisar talab built in 1490 AD [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Tankas/Tanks** : Prevalent in Bikaner, Rajasthan, India these structures are mainly underground holes made in the ground inside the main house to collect rain water. These structures were polished with lime and pasted with tiles to keep the water cool and uncontaminated which can be later used for drinking and irrigation purposes. The oldest tank known is Fatehsagar tank built in 1780 [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Stepwells or Baoli** : Baolis are the wells with descending step. These structures are mostly found in Gujarat and Rajasthan. The baolis were used to store water during drought as well as acted as retreats during hot summers. These baolis also served as a place for societal meetings and religious functions [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Jhalara :** Jhalaras are one of the most prominent techniques of rain water harvesting systems in ancient India. Jhalaras consist of a large shallow basin that collects rainwater from rooftops of nearby buildings and other similar sources. Jhalaras have the advantage of better storage capacity, lower maintenance, efficient filtration, lower cost, greater flexibility and reduced urban flooding compared to the other traditional water harvesting systems. The Mahamandir Jhalara of Jodhpur dates back to 1660 AD and is said to be one of the oldest Jhalara [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Naula, Gul, Dhara, Simar, Khel** : Found in Uttarakhand and Himalayan ranges, a Naula is a type of small hut made of stones built to cover a spring. Gul is a system of small channels that supplies water to the fields. Dhara is a naturally occurring spring source [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Kul, Khatri :** Used in Himachal Pradesh, a Kul is almost identical to a Gul. A Gul is connected to a channel that diverts water from a source to another direction or to a reservoir. Khatri is a tank built with stones that harvests rain water and prevents percolation of water to the ground [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Zing** : These are small tanks specific to Jammu, Kashmir and Ladakh region and were to made to collect melted water from glaciers [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Kunds** : These are saucer shaped areas lined with lime, usually made for harvesting rain water in Utter Pradesh, India. While lime prevents water contamination, water inlets were fitted with wire mesh to prevent unwanted objects falling into the well pit. These structures were mostly used for drinking

water purposes during dry seasons. According to some archeological evidence, the first kund at Vadi Ka Melan, dated 1607 AD, was built by Raja Sur Singh [6, 7, 8, 9, 12, 13, 14, 15, 16].

- **Ahar Pyne :** Ahars and pynes were used to store water during the rainy season in Bihar, India. Ahars are basically rectangular basins sided with embankments on three sides and attached to a small pyne on the fourth side. Pynes are the man-made channels developed to connect water from the rivers to the nearby fields for irrigation purposes [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Bamboo Drip irrigation :** This ingenious system was developed by the Khasi and Jaintia tribes of Meghalaya some 200 hundred years back especially for black pepper cultivation. Pipes made of bamboos are used to channel the water from springs in the hill tops to low lying areas through gravity. Again, at the field there are layers of channels of bamboos of different forms used for distribution of water. At the last stage of the system, the number of channel sections and diversion units are reduced [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Apatani :** This system is named after the Apatani tribes of Arunachal Pradesh who used this system to harvest both ground and surface water for irrigation and fish farming purposes. Dams supported by bamboo frames are used to terrace a field into plots. Water inlets and outlets are built on these plots [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Dongs, Garh, Dara :** The Bodo tribes of Assam used to harvest rain-water using Dongs, a centuries old technique similar to a pond for irrigation purposes. The water into the Dongs is diverted from a river through a diversion channel. These Dongs are individually owned and community participation is not necessary for its maintenance. The Garh is in the form of a big nala and is used to divert water from the rivers to the fields. Dara is a small embankment made in a paddy field by dividing it into small square pieces to store rain water [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Jampois** : Jampois or Dungs are mostly found in Jalpaiguri, West Bengal, India. These are small irrigation canals connecting rivers and paddy fields [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Zabo :** Zabo is a multipurpose water conservation system developed in Nagaland, India and is used for agriculture, foresting, fishing and animal care. This system is also known as Ruza system. In hilly terrains, run-off rain-water is collected in a pond-like structure. The water from the ponds is then channeled into the paddy fields on the foot hills [6, 7, 8, 9, 12, 13, 14, 15, 16].
- **Jackwell :** This system was developed by the Shompen tribe of Great Nicolar Island. Logs of hard bullet wood were used to make bunds in the low-lying areas. Further, bamboos were split longitudinally, put under trees at gentle slopes to collect rain water from leaves and leading this water to a shallow pit called

Jackwells at the lower end. The Jackwells were then interconnected to form a bigger structure of dimensions approximately 6m in diameter and 7m in depth forming an efficient water management system [6, 7, 8, 9, 12, 13, 14, 15, 16].

Government Initiatives :

The National Action Plan on Climate Change (NAPCC) was released by the Government of India on 30th June 2008 [16]. The National Water Mission (NWM) is one among the eight National Missions identified by the government to address the challenges posed by climate change [17]. The primary aim of the NWM is 'Conservation of water, minimizing wastage, and ensuring its more equitable distribution both across and within States through integrated water resources development and management' [17]. The Jal Jeevan Mission (JJM) was launched in 2019 which focuses on achieving universal and equitable access to safe and affordable drinking water for all by 2030 [18]. The Ministry of Jal Shakti was created in May 2019 mainly for conservation of water and revival of traditional water bodies. It also aimed at promoting efficient use of water in agriculture, industry, and domestic sectors by involving local communities and creating awareness about water scarcity and how it can be managed [18]. Another initiative taken by the Ministry of Jal Shakti is the Atal Bhujal Yojana. It aims at promoting sustainable groundwater management [18]. Some other important initiatives taken are the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), 2015, Accelerated Irrigation Benefit Programme (AIBP), National Aquifer Mapping and Management Programme (NAQUIM) and Bureau of Water Use Efficiency (BWUE) [19, 20, 21, 22].

Success Stories :

Alwar, once a region historically rich in water with community traditions of rain water harvesting using structures called Johads, started drying up by 1980s. Reasons for this are mainly attributed to deforestation leading to erosion of soil, water percolation and a drained groundwater table. The land being unfit for agriculture or rearing livestock, forced migration of its people to cities. Tarun Bharat Sangh (TBS), a Non-Government-Organisation (NGO) from Rajasthan, started work on this area in around 1985 [23]. The studied the actual needs of the local communities, its ecology and revived the old system of water conservation called Johads. When the first Johad retained and filled up a few village wells, the second Johad was built in 1986. Soon a system of Johads was built filling up every other well in the village. Soon the land turned rich and fertile. By 1988, this community initiative reached seven other neighboring villages. Dr Rajendra Singh, the founder of TBS was since then acclaimed as the "Waterman of India" [23].

Jakhni in Uttar Pradesh's Banda district is another example of traditional wisdom and community participation. Due to the vision of social activist Uma Shankar Pandey, rainwater was trapped in the fields using raised embankments called Medhs [24]. These Medhs were then surrounded with trees to avoid erosion. Soon, the barren land became a thriving agricultural hub. The Jakhni model was replicated in around 1050 other villages

across the country by the Indian Government. For his contribution to water conservation, Pandey was awarded the Padma Shri in 2023 by India [24]. More such success stories are available at https://jalshakti-dowr.gov.in/government-initiatives [**25**]**.**

Discussions :

Murthy *et al.* in their paper in ISVS e-journal, 2022, 9 (2), discusses how for an agrarian society like India alternative sources of water is a must. Due to population and pollution, freshwater is scarcely available in India [13]. Due to over use of modern techniques like borewells and tubewells, the ground water tables are depleted. The traditional systems of water systems are not only more efficient and dependable, they can be made from locally available resources, have low environmental impact and can last for decades [13]. Moreover. these traditional systems of water harvesting also have socio-economic and cultural significance. This was shown by Nandini et al. in her study of revival of traditional water harvesting systems in the drought prone regions of Tamil Nadu [26].

Conclusions :

The "*United Nations World Water Development Report 2024: Water for Prosperity and Peace*" highlighted how water scarcity can adversely affect lives and livelihoods. It further explores, how water can bring unity, peace, sustainability, climate action and regional integration [27]. So, time has come for the policy makers to take water conservation seriously before it's too late. Though the harmful effects of rapid urbanization cannot be completely undone, the knowledge of traditional water harvesting systems along with modern techniques & advancements can lead to a better and sustainable future. The traditional techniques of water harvesting are ecologically safe, dependable and economical. Awareness programs about these systems and community participation combined with modern technology, can be answer to India's perennial water issues.

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Religious Foundations and Evolution of Higher Education in India: From Ancient to British India

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Abstract

The evolution of the Indian higher education system reflects a rich historical trajectory shaped by diverse influences across ancient, medieval, colonial, and post-colonial periods. Initially, the system was deeply rooted in religious traditions, with the Brahminical and Buddhist educational frameworks prevailing during the Vedic period. While the Brahminical education was largely governed by religious values, the Buddhist approach was more secular, allowing broader access to education. The medieval period saw the emergence of Madrasahs under Islamic rule, with significant impacts on the existing Brahminical and Buddhist institutions. However, the most transformative phase occurred during British colonial rule, where the introduction of English education and the establishment of universities such as those in Calcutta, Bombay, and Madras profoundly reshaped the Indian higher education landscape. Despite these developments, the period also witnessed resistance from Indian elites who sought to use higher education as a means to support the growing nationalist movement. This complex history highlights the role of higher education in social change, intellectual progress, and the broader development of India. The study highlights the dual impact of these changes on India's educational landscape, emphasizing how higher education has been a crucial agent of social change and national development throughout history.

Keywords : *Higher Education, Brahminical Education, Buddhist Education, Indian Universities, Educational Evolution.*

Introduction

The English education system has taken a prime position in the Indian higher learning institution in today's time. But the higher education system of India has evolved through different periods, like the ancient, medieval, colonial and post-colonial. The institutions of higher learning are considered the most important agency of social change, social transformation, and entire development of the country. In fact, this journey of higher education started with an ancient system of education in the Vedic period in which two types of educational system were present there, viz., the Brahminical and the Buddhist systems of education. The Brahminical system of education was regulated by religious values, while the Buddhist form of education was secular in nature. But the major change in Indian higher education took place through the initiatives of British rulers that made an impact both in positive and negative ways.

Religious Influence

During ancient times in India, the educational system for higher learning was predominantly influenced by religion. The prevalent religions during that period were Hinduism and Buddhism. The educational system, which was founded on religious principles, played a crucial role in the generation, evolution, and dissemination of knowledge and ideas to the wider society. The two primary systems of religious-based education during that era were the Brahminical or Vedic system and the Buddhist system (Ghosh).

Brahminical Education

Brahminical education developed in India in the Vedic Period (Jha, 1991). During this period, efforts were made to preserve the oral transmission of religious texts in the Rigveda. The domestic schools of that time, which were run by teachers called 'Rishis,' were the educational institutions based on the Rigveda, where they instructed their students in the literature they possessed. Women enjoyed an equal status during this period and were admitted to educational facilities. The learning was conducted in Sanskrit and included the study of Smritis and Shastras. In the later Vedic age, from 1000 BC to 600 BC, there were three types of educational institutions in existence (Jha, 1991). The first type of educational institution admitted pupils at a young age. The second type, called "parishads" or debating circles, organized various discussions to introduce students to different aspects of knowledge. The third type consisted of conferences convened by kings and emperors, where representatives from various schools presented their teachings. The pursuit of higher knowledge occurred in 'Brahma Sanghas,' while the highest form of knowledge was acquired in the parishads.

During the later stage of the Vedic age, the Varna system became dominant, and it was monopolized by the Brahmins. While women were influential in their sphere of education at that time, they were relegated to the background (Jha, 1991). During this period, higher education was primarily for the service of the priesthood or ritualistic

religion. These developments occurred before the Upanishads, when teachers were typically Brahmins from the priestly class (Ghosh, 2001).The elaboration of educational rituals was only done in the post-Vedic early classical age from 600 to 300 BC. Although members of the three upper castes were theoretically allowed to have an education during this period but the Brahmins were the dominant class that monopolized the education system.

Buddhist Education

In contrast to the Brahminical education system, the Buddhist education system was not only religious but also secular, and it introduced the monastic education system. The most significant aspect of Buddhist education was that it was open to all persons, regardless of their caste, except for slaves, army deserters, and those who were disabled or sick (Jha, 1991, p. p. 3). It grows out of the teachings of the Buddha as classified as Vinaya (monolithic discipline), Sutta (group discourse) and Abhidhamma (works of doctrine) (Ghosh, 2001, p. p. 54). Under the Buddhist education system, the monasteries were similar to modern-day universities.

The Buddhist seats of learning taught various subjects, such as the four Vedas and Vedangas, astrology, astronomy, yoga, Nyaya, music, medicine, the art of war, magic, poetry, and several other subjects related to art and craft. Taxila was the most famous Buddhist higher education institution of that time, renowned for its schools of medicine, law, and military science. By the mid-6th century, it had acquired a reputation as a great center of learning, attracting scholars from distant parts of India (Dongerkery, 1997). Students were not restricted by caste when choosing their discipline of study. Brahmins could choose to study archery, and Kshatriyas were free to study the Vedas or Upanishads as well.

During the 7th century B.C., Banaras was renowned as a hub of knowledge and education. In the era of Ashoka, the Sarnath monastery located in the vicinity of Banaras gained recognition as a prominent center of learning, attracting a significant number of Buddhist monks (Choudhary, 2008, pp. pp. 50 -72). Among the significant educational institutions of ancient India were Nalanda, Vallabhi, and Vikramshila. In addition to Taxila, Nalanda emerged as a vital center of Buddhist education for advanced studies. Located in Bihar, it drew students from not only India but also other nations, including Nepal, Korea, China, and Tibet. Nalanda was renowned for its curriculum in Buddhist and Brahminical texts, as well as its practical and secular subjects. It was worth mentioning that the University was run democratically (Jha, 1991). Nalanda was renowned for teaching Mahayana Buddhism, while Vallabhi in Gujarat specialized in Hinayana Buddhism. Another prominent institution for advanced Buddhist studies was Vikramshila, located in the present-day Bhagalpur district of Bihar.

Rigveda was the basis of education in ancient India which was composed by the priests orally among the Aryans between 1500 and 1000 B.C (Choudhary, 2008, p. p.

54). During that time, the Brahmins were appointed as advisors to Kings and Emperors, and they held significant influence over religious scriptures. The Brahmins created a set of religious texts, known as Brahmanas, to assert their dominance. Aranyakarand Upanishads were added to the Brahmanas and by 600 B.C., they together with the Vedas and their six Vedangas were studied in the Vedic schools by the Brahmins, the Kshatriyas and Vaishyas (Ghosh, 2001, p. p. 175). In contrast, the Shudras, who were regarded as the lowest caste, were forbidden from studying the Vedas and were limited to learning vocational skills such as animal husbandry, spinning, weaving, and other artisanal trades. The Buddhist education system, on the other hand, provided opportunities for individuals from all castes, as it offered a straightforward path to salvation. As a result, the Buddhist Viharas did not possess the inherent vitality of the Vedic schools (Ghosh, 2001, p. p. 158). Thus, it is evident that ancient Indian higher education had a rich tradition.

Higher Education in Mediaeval India

The medieval era in India played a crucial role in the advancement of higher education, as it reflected the social, economic, and religious aspects of medieval Indian society. The state, along with other agencies such as Sufism and Bhakti ideology, was instrumental in facilitating integration and co-existence in a protracted process (Choudhary, 2008, p. p. 55).

Although several early educational centers persisted during this era, Madrasahs emerged as the new focal point of higher learning in medieval India. Brahminical education was restricted to Hindu kingdoms and primarily focused on the priestly castes. Conversely, Buddhist educational institutions suffered severe damage during this period, particularly institutions like Taxila and Nalanda (Alam, 1991, p. p. 17). The first Islamic invasion in India, led by Mahmud, resulted in the destruction of educational institutions in several significant cities in Northern India, including Hindu temples and Buddhist Viharas. The libraries of Nalanda and Vikramshila suffered severe damage as well (Choudhary, 2008, p. p. 56). However, many Hindu educational institutions in Banaras, Nadia, and Mithila continued to exist and emerged as important centers for intellectual development (Ghosh, 2001, p. p. 112). In Banaras, students were required to study only in Sanskrit, but specialization in the language was restricted to Brahmins. During the Mughal reign, Mithila gained prominence for its studies in Logic, much like Nadia. However, an important aspect of education in Nadia was that Sanskrit was freely accessible to people of all castes.

During the medieval period, which was largely dominated by the Mughals, there were three primary institutions of learning: Muktabs, Madrasahs, and Khangahs. Muktabs provided basic education, while Madrasahs imparted higher education. Khangahs, on the other hand, were responsible for providing religious or theological education (Ghosh, 2001, p. p. 20). Women education was also given equal importance in the Mughal period. Gulbadan Begum, the sister of Humayun wrote Humayun Nama

is an example of women education during this period (Dongerkery, 1997, p. p. 13). Therefore, it is evident that the developments in higher education during the medieval period aimed to establish a balance between various social groups and the aspirations of the people of that time.

Unveiling the Educational Landscape of British India

It is evident that the current higher education system in India has been influenced by the British pattern of education to a great deal. During their rule, the British East India Company had the need to maintain offices in India but found it expensive to bring British clerks from London. To address this issue, the Company aimed to provide western education to the Indian population. As their activities grew, they established schools and colleges, and with the increasing number of British personnel in India, it became necessary to establish educational institutions for their children (Panikkar, 2001, p. p. 3614). The needs of the colonial masters during the colonial era of India determined the development of education in the country. The entire Europe as well as England has witnessed industrial consolidation towards the end of 18th century and in the beginning of 19th century (Hobsbawm, 1999). Expansion of English language and their culture became the need of the colonial rulers in their colonies.

In order to develop studies on Arabic and Persian languages the first Governor-General of India, Warren Hastings established the Calcutta Madrasa in 1781. In 1791, Jonathan Duccan from Banaras established the Banaras Sanskrit College to spread the learning of Sanskrit language (Robinson(ed), 1989). These institutions were established basically with the idea of training the Indian people who will act as the assistants to the British Judges to interpret the Hindu and Muslim laws. A section of upper-class Indians was also satisfied with the establishment of these institutions as these were preparing them for the government jobs. From its initial years to up till 1812, the basic educational activities on the part of East India Company were the establishment of these two educational institutions in Calcutta and Banaras and the approval of grants-in-aid to some private schools of that time. In 1813, the Charter of East India Company was renewed. The most serious concern of the Indians towards this Charter was regarding the medium of instruction. In 1823, a committee was formed to resolve all the issues related to this charter. With ten members, the Central Committee of Public Instruction was formed. The chairman of this committee was Lord Macaulay who was the Law Member of the council. As the Chairman, Macaulay on February, 2, 1835 wrote a Minute on the issues concerned. This Minute of Lord Macaulay was like the foundation stone English education in India (Sarkar, 1970, pp. pp. 338 - 348).

On March, 7, 1835, Lord William Bentinck, the then Governor-General of India, after a month of Macaulay's note on Indian education gave the ruling that the objective of British Government is to promote the literature and science of Europe in its colonies. He also ruled that all the funds in this direction would be provided by the British

Government. The political benefit of the British government was one of the basic reasons for this development as there was a growing opinion and recognition of this fact. Another reason was the needs of the colonial rulers for their administrative purposes. When the Charter Act of 1833 was passed, the British East India Company was in a serious financial crisis and needed to cut down its expenses. Lowering the number of employees from Europe and employing natives from the colonies in lower wages was a good option for the company at that time. After this Act, the doors for Indians in the lower order civil services were opened-up. Therefore, the policy of 1835 was ruled by Lord Bentick (Sarkar, 1970) .The expansion of the British market was another cause for spreading English education in India.

The official and court language of British India was replaced from Persian to English in 1837. In 1844, it was announced that the Indians with English education will be given preference in the civil services under company's rule (Chandra, 1965, pp. pp. 417 - 431). In accordance with the growing popularity of English education, in 1854, Sir Charles Wood forwarded a Despatch which in the later period came to be known as "Woods Despatch". In his dispatch Charles Wood recommended the setting of the University of Bombay, the University of Madras and the University of Calcutta, which in 1857 were established (Kumar K., 1998, pp. pp. 447–454). The three universities formed after Woods Despatch was structured on the model of London University. They were purely examining bodies and drew their candidates for different examinations from affiliated colleges and schools (Mukerji R., 1974). In accordance with the establishment of the universities of Bombay, Madras, and Calcutta, the University of Punjab was founded in 1882, and the University of Allahabad followed in 1887, both based on the same model as the earlier universities. By 1901-02, there was a very rapid expansion of college education. As against 68 colleges in 1881-82, there were 176 affiliated colleges in 1901-92, 138 in British India, 32 in Indian states and 9 in Ceylon (Mukerji R., 1974, p. p. 169).

At the beginning of the 20th century, there was a decline in the grants received by universities and colleges. This decline was due to the growing belief among British officials that there was a connection between the popularity of Indian nationalistic sentiments and English education. This perception led to a reduction in funding for educational institutions, which was seen as a means of curbing the growth of nationalist movements in India. In 1901 another landmark in the direction of Indian education came in the form of Indian University Commission under Lord Curzon, the then Governor-General of India. The commission was formed with the basic responsibility of finding out the conditions and to inquire the prospects of university education under British India. The Indian Universities Act of 1904 was the result of the Indian University Commission of 1901. It urged for changes in the composition of the structure of administrative bodies in universities. But the Act rejected the idea of setting up of new universities at Aligarh, Banaras, Decca, Patna, Rangoon, and Nagpur, though there was a heavy vocal demand for them. It also could not conceive of universities other than the affiliation type (Mukerji S., 1976, p. p. 170).

The Indian Universities Act of 1904 marked a watershed moment in Indian university education, granting universities the authority to offer teaching and research programmes (The Indian Universities Act, 1904, 1904). The Government of India Resolution of 1913 formalized this by emphasizing the need for local, residential, and teaching universities in each province of British India. In addition, the resolution called for the establishment of residential and teaching universities in Decca, Aligarh, Banaras, Patna, and Nagpur. The establishment of these universities, as well as the provision of teaching and research facilities, was viewed by the government as a means of promoting intellectual progress and fostering corporate sentiment among Indians. In pursuance of this policy as advocated above and meet with new developments, the following new universities sprang up: Banaras and Mysore in 1916, Patna in 1917, Hyderabad in 1918, and the S.N.D.T. women's university in 1916 (Mukerji S. , 1976, p. p. 172).

There was the establishment of few universities that adopted Urdu as the language of instruction. In order to meet the demands and aspirations of the Muslim community, in 1875 under the leadership of Sir Syed Ahmed, the M.A.O. College, Aligarh was formed and was later developed into a Muslim University (Azhar, 2017, pp. pp. 107 - 109).

The Government of India Act, 1919 established a new political structure in Indian administration called the "Diarchy." At the provincial level, the Act divided government activities into reserved and transferred departments. For the first time, the Department of Education was handed over to Indians themselves under this system. As a result of this encouragement, more universities were founded after 1919, and India had 19 universities before its independence. As the number of universities grew, so did the need for an organization to coordinate their efforts. The government of India convened a Conference of Indian Universities in 1924 to establish an Inter-University Board, which would serve as the inter-university organization and information bureau for these universities (Kumar P. , 2008).

During the British period, there was a lack of consensus on India's education policies, and the clash of interest between the Indian elites and British rulers was evident. The British rulers aimed to control the students' activities to prevent them from engaging in active politics, while the Indian elites saw higher education of Indians as a tool to strengthen the ongoing National Independence Movement and develop human resources for India's development.

Conclusion

The higher education system in India has been significantly shaped by the British colonial influence. During their rule, the British East India Company sought to educate the Indian population in Western ways to meet administrative needs and reduce the cost of employing British personnel. This led to the establishment of schools, colleges, and eventually universities modelled after London University. The expansion of English-language education was intended to serve colonial interests, preparing a workforce of

clerks and administrators. However, as nationalist sentiments grew, the British government reduced funding for education, fearing its role in fostering independence movements. The establishment of universities like Banaras, Aligarh, and others aimed to promote intellectual progress, yet the underlying motives remained tied to colonial control. Ultimately, the British education policy in India was marked by a tension between the colonial rulers' desire to maintain power and the Indian elites' efforts to use education as a tool for national development and independence.

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Assamese Traditional Practice of Cloth Making : A Study on 17th -19th Century Assam

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Abstract :

Spinning, weaving and sericulture are important parts of the cultural heritage of Assam. The traditional cloth making industry holds a unique position in the economy of Assam. In medieval Assam, the handloom industry grew rapidly due to the efforts, cooperation and support of the Ahom Kings. Assamese women belonging to every class, caste or faith were engaged in spinning, weaving and dyeing. The presence of handlooms was as common to every Assamese family as the kitchen. The weavers of medieval Assam produced enough clothes both for their household consumption as well as for supply to the nobility and royal house. Assamese handloom products were famous for its unique charm and aesthetic appeals. Though with the advent of the colonial rule in Assam in the first half of the 19th century, the importance of traditional handloom industry declined, still spinning and weaving were considered as necessary accomplishments for every Assamese woman. In Assam, during the period of this study, women mostly used throw-shuttle loom in plain areas and in hill areas loin-loom was used for weaving. The present paper makes an attempt to study the traditional practice of cloth making in 17th-19th century Assam.

Key words *: Assam, weaving, spinning, silk, dyeing*

Introduction :

During the pre-colonial times Assamese society was self-sufficient in the matter of cloth; as Assamese women produced enough clothes to full fill the clothing requirements

for their families. In Assam, clothes were manufactured by the means of hand weaving. Assamese women produced thread from cotton as well as they used to produce silk thread from the cocoons of the silk worms. It was an exceptional feature of Assamese society that there was no any particular caste reserved for weaving(Bhuyan, 66). From a very young age Assamese girls acquired knowledge of weaving cloths and the techniques of handloom weaving are handed down from one generation to another. Francies Hamilton noted that, in the early nineteenth century Assam, every woman of all castes, from the queen downwards, weave four kinds of silk that they produced in the country, and with these clothes three-fourths of the Assamese people were clothed. (Hamilton, 61)

Objectives of the study :

This paper aims to study the traditional cloth making process prevalent in the 17th -19th century Assam. It discusses the traditional spinning, weaving and dyeing practices of Assam. The present work also tries to assess the equipment used in the traditional handloom weaving process.

Methodology :

This study is historical and descriptive in analysis and data have been collected from both primary and secondary sources. The former includes the *buranji*s, some British official records, survey of archival sources as well as various contemporary literary works published in periodicals, newspapers etc. Secondary source data consist of relevant literature on the topic.

Discussion :

Silk rearing process :

Assam is known for its rich silk culture. Three kinds of silks were produced in Assam during the period of our study. These were- *Muga* silk, *Eri* silk and *Pat* or mulberry silk. *Kautilya's* reference to *kshauma, dukula* and *patrorna* cloths obtained from *Suvarnakunda* (in kamarupa) may be the *eri, muga, pat* silk of Assam (Choudhuri, 330). Muga silk worm were reared on trees in open air and much care was needed for attending them. Muga silk worm passes through four phases, egg, larvae, cocoon or pupa and moth. The *muga* moths come out of the cocoons after 18 days during summer and 30 days during winter. After coming out of the cocoons the moths became ready to coupling with the moths of opposite sex. The paired couple was tied together in wisps made out of thatching grass. Subsequently the female moths start laying eggs. The young larvae within a p*eri*od of eight to twelve days come out of the eggs. Then the caterpillars are tied in the *som* (Machilus bombycina) or *sualu* (Litsaea polyantha) trees. The worms eat the tender leaves of the *som* or *sualu* trees for a period of 22 to 50 days. Then they become mature to weave cocoons. The rearers put the worms in *salonies*, a triangular bamboo made rearing appliance. Then again put them in another tree full of leaves. When the larvae become mature, they stop eating leaves. The mature worms were put

on *jalis* made of partially dried tree leaves for two weeks to spin cocoons. The cocoons are harvested from the *jalis* after a p*eri*od of seven days during summer and 12 days during winter. Then the cocoons selected for reeling are dried up under sunlight or smoked to kill the pupa inside and the cocoons selected as seed for the next breed are preserved in bamboo baskets so that the pupi remained unharmed. The cocoons have to be boiled in an alkaline solution (*kharani*) for about fifteen to thirty minutes to remove the natural gum contained in the silk. Traditionally a kind of tool called *bhangori* is used for reeling.

The *eri* worms are reared entirely within doors. The female *eri* moths are tied to long reed or canes. In each reed or cane twenty to twenty-five moths are kept. The reeds are hung up inside the house. The eggs laid by the moths during the first three days are tied in a piece of cloth. When a few of the worms are hatched, the cloths are put on small bamboo platters. The worms are fed tender leaves. After that, the worms are removed to feed on bunches of leaves. When the worms stop eating leaves, they are kept in baskets filled with dry leaves to form cocoons. Keeping some cocoons for next breed, others are exposed to the sun for two to three days. After it the cocoons are boiled in a potash solution over slow fire. Removing them from water the silk is draws out. The thread is then exposed to the sun (Robinson 227,228). The appliances used for spinning *eri* are the drop spindle or *takuri* and *jatar* (spinning wheel).

Cultivation of pat silk was confined to a particular community called the *Katoni* or *Jugi* in medieval Assam. *Pat polu* or Mulberry silk worms are reared indoors. The Mulberry silk worms are of two types- *Bar polu* and *Soru polu*. R Das Gupta cited the following description from B. C. Allen's writing, published in the Assam District Gazetteers, Darang (Ch. V, p 153) about the production process of mulberry silk worm, "The eggs of the Bar Polu take ten months to hatch …The life of the worms lasts forty days, and the cocoons take six days to spin. The cocoons are of bright yellow colour, but the silk when boiled in potash water, becomes perfectly white. From twelve to fifteen thousand cocoons are required to yield one pound of thread...The thread obtained from the *Soru Polu* is not so valuable as that of the bombyx textor, but as the worms yields four broods in the year it finds greater favour with the cultivators" (Das Gupta 195).

Cotton thread :

Cotton was produced chiefly by the hill tribes. They used to sell it to the people of the plains in the *hat*s (markets). Basically, the kachari, Garo and Mishing communities produced fine cotton clothes (Das Gupta 196). The cotton produced in the Muttack country was nearly twice valued than that of the Garo Hills (Robinson 240). A type of a good quality cotton known as *Bariya kopah* (cotton) was produced in Assam. Another kind of cotton produced in Assam was *Sepeti kopah* . But with the easy access of cheap mill made imported cotton thread, Assamese people gradually left cotton cultivation. During the 19th century, the affluent section of the Assamese society began to prefer

imported cotton clothes. Though spinning lost its utility from the time when mill made yarns became easily obtainable, weaving was continued by Assamese women till today (Goswami 169,170).

In preparing threads from the fibers of different trees, hill tribes of Assam were very expert. Even from the Chorat plant, which is a devil nettle, the Abors used to spin threads and made clothes (Rajguru 301). In the medieval period, there was a custom among the Assamese warriors to go to the battlefield wearing a particular kind of evil-averting dress called *Kavach Kapor* or talisman cloth. Dr. John Peter Wade noted the following description about the production of the *Kavach Kapor* , "At midnight the cotton is cleared from the seeds, formed into rollers, spun into thread, manufactured into clothes worn by the warrior. The work must be completed before daybreak. It is written in the Shastrus that it is fortunate to wear this cloth in battle" (Wade 34).

Weaving process and the tools used :

The weaving process constitutes interlacement of two sets of threads viz., warp and weft and the equipment which assists this interlacement is called the loom. Looms, that used by Assamese weavers during the period of our study can be classified under two groups- *Mati sâl* or throw shuttle loom and *kokâlot bondha sâl* or loin loom.

Mati sâl or throw shuttle loom :

This type of looms was used in the plain areas of Assam. In these looms four bamboo posts of about six feet high were dibbed into the ground with provision for holding two bars called *Jakhala mari*. At these *Jakhala maris* the loom was let hang with the help of a bamboo pole called *Chalimari*. In this kind of looms shuttles were thrown across the thread by hand. The equipment used in the throw shuttle loom were-

- *Tolothâ* : *Tolothâ* is a wooden cylindrical roller of about 883 in length and 63 in diameter. Two *tolothâs* are used in a loom, one for holding the yarn and other for holding the cloth.
- *Darpati* : *Darpati* is a wooden flat bar of about 703 in length and 23 in width.
- *Mâko* : *Mâko* is the wooden shuttle with two pointed ends. It is used to pass weft thread through wrap thread.
- *Mahurâ* (pin) : It is narrow bamboo tube of about 2 ½ 3 in length. It has a hole from one end to another. It used to wind weft thread to weave cloth and an iron or bamboo stick called *gereli mâri* or *gereli kâthi* is used to place the *mahurâ* in the mako. Another tiny bamboo stick called *gereli khuti* is used to keep *gereli kâthi* in proper position.
- *Rânch* (Reed) : *Rânch* is a bamboo comb fixed with a reed cap made of bamboo and wood.
- *Baw* (Heddle) : The warp shed is formed with the heddle and a bamboo rod or stick called *baw sali* or *naki sâli* is used to keep heddle. A bamboo tube called *baw cungâ* is used to make heddle or *Baw* before weaving.

- *Dângmâri : Dângmâri* or *Tâldhorâ* is a bamboo stick of about 883 in length and it is used to make the harness of the loom attached to the lower portion of the heddle shaft. Two *dangmaris* are attached crosswise on the cord of the *garaka*.
- *Garaka* (*treadle*) : It is a pedal placed bottom of the loom. Heddle shafts are connected in it by means of cords.
- *Garakâ khuti* : It is the post placed at the end of the *Garakâ* .
- *Cirimâri* : This is a wooden or bamboo rod of about 57 ½ 3 length and 1 ½ 3 width, which is used to divide wrap threads ahead of the heddle shafts.
- *Phulor kâthi* : Flat bamboo sticks used to weave motifs in the clothes.
- *Sali*: It is a long and thick bamboo stick used in the time of weaving motifs on the textile.
- *Putol : Putol* is a bamboo or wooden rod with two small nails at the end of both sides to keep the cloth end properly
- *Posts* : Four big and two small bamboo posts are used to fix the loom on the ground.
- *Nâchani* : It is a small piece of bamboo or wood, flat in shape and having a central hole to contain a thin rod. The two ends of the *Nachani* are attached to a strong *sali* which holds the heddles in upward direction.

Besides these, *Kan dia mari* (bamboo or iron rod used to revolve the beams), *Jatar* (spinning wheel), *Letai, Ugha, Chereki* (wooden rollers of different sizes) were required to complete a *mâti sâl*. Almost all the parts of this type of loom were made by Assamese people in the period of our study with their own labour.

Kokalot bandha sâl or loin loom :

Loin loom is a kind of primitive loom used by the people of the hilly areas of Assam. These looms are also called Back strap loom because this type of looms is attached to the body of the weaver with a back strap. These looms are portable. They don't have any permanent fixture or heavy frames. Loin loom consisted of :

- *Front bar* : It is a circular wooden bar put in between two loops.
- *Breast bar* : It is a circular wooden bar. The wrap thread is fixed between the front bar and the breast bar.
- *Sword* : A sword is a flat piece of wood; it's one end is pointed and the other is blunt. It is rests in front wrap.
- *Healt bar* : It is a circular bamboo bar.
- Another circular bamboo bar is placed after the healt bar.
- *Lease rod :* It is fixed after the circular wooden bar mentioned above.
- *Back strap* : It is made either of cloth or leather. The two loops at the end of the back strap are attached to the notches of the front warp bar.
- *Shuttle* : It is a bamboo piece ship containing yarn.

During the time of weaving the healt bar is lifted with the weaver's left hand and the circular bamboo bar is pressed down simultaneously by the right hand. The sword

is then placed in the shed keeping vertically and the weft is passed from the right to left through the shuttle. The weft is then beaten up by the sword. The sword is then taken out and the centre thread is produced through which the shuttle is passed by the left hand from the left side and picked up by the right hand in the right side. The sword is used again to beat the weft. The process is repeated (Bahadur 29,30).

Traditional dyeing technics :

Before the yarns produced by modern textile factories became easily accessible, Assamese weavers used to dye threads by indigenous dyeing process. In Assam, instead of dyeing cloth, people used to dye threads. Banabhatta mentioned in Harshacharita that Bhaskaravarmana, the king of Kamarupa gifted many coloured clothes along with other articles to Harshavardhana (Baruah 16). This reference indicates that, since ancient times, people of Assam knew the art of dyeing. A great variety of dye stuffs were used for dyeing threads. Sometimes different items were used in different areas of Assam for producing the same colour. Barks, leaves, fruits and roots of different trees like *Achchugach, Majathi, Palash, Chandan, kujithekera, Borthekera, Tepartenga,* Turmeric*, Bhamrati, Jarath, Urahi, Leteku, Jammu, Bharathi, Silikha, Amlakhi, Madhuriam,* lemon, *kendu* fruites, pomegranate as well as lac, indigo, vermilion was used as dyeing material in Assam. *Leeteku* was used to produce red, *Bharathi* for yellowish colour, bark of *Jamu* for black colour, *Palash* mixed with the roots of *Achchugach* produced maroon colour, *Majathi* or *Manjit* or Indian madder was used to produce reddish yellow colour and by mixing it with Lac, *Barthekera, Leteku* scarlet red colour can be produced. Red was also produced from red *Chandan.* From *Urahi* green colour was produced, *Sewali* was used for producing yellow colour, the *Nil* or indigo produces blue colour but by mixing it with other elements one can prepare black, purple or green colour. Lac was used to dye both silk and cotton fabrics. Pradip Chaliha in '*Purani Asomar karikari Silpa*' mentioned about forty-eight plants which could be used as dyeing agents. Some of these species were used as mordents so that the colour remains permanent. For example, *Bhumrati* leaves was used as mordents with every colour except blue. Assamese people regarded the craft of dyeing as an ordinary household activity and therefore they did not realize its commercial value. With the easy availability of imported dyed thread, Assamese people abandoned the practice of dyeing. Rajen Saikia remarked, "By the end of the 19th century, the number of people engaged in domestic preparation of dyes and dyeing was few and far between. Within the next twenty years it became a thing of the past" (Saikia 53).

Ornamentation in fabrics

Along with dyeing, embroidery too was a highly skilled work during the period of our study in Assam (Baruah438). Assamese people used a king of gold and silver thread called *guna* in embroidery works. *Guna* was locally produced by a class of workmen called *Gunakatia.* In addition to *guna*, different coloured threads were also used in embroidery work.

Assamese textile motifs were inspired by rich biodiversity. Natural objects like flowers, birds, animals and geometric patterns find expression in the Assamese textile. Besides, some religious motifs were also used by Assamese weavers.

Assamese traditional cloth producing technics were basically weaving oriented. Assamese weavers basically embroidered clothes in loom; hand embroidery was not a very popular practice during the time of our study. It is believed that sewn up cloth became popular in Assam approximately from the fourteenth century, because there is no any evidence of sewn costume in Assam before it come into frequent contact with the Muslims (Sarma 252).

Though in Assam printed cloth making was not common, yet *Bandhani* or tie-dye cloth was produced in Assam in small scale. Pratap Chandra Goswami mentioned in his autobiography that, in Lower Assam Bandhani clothes were integral part of bridal dress. These clothes were made by colouring different parts of the clothes while these were folded and tied up.

Conclusion :

Handloom weaving has a great significance in the socio-economic life of Assam since early times. Assamese society was self-sufficient in cloth production during pre-colonial times. Clothes were basically manufactured by the means of hand weaving. By rearing silk worms and producing silk thread from the cocoons of these worms, clothes were woven. Cotton clothes were also produced in Assam. Weaving technology remained almost same during the period of this study as the earlier times of the medieval period.

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Transformation of Indian Farming System : A Comparison of Traditional Farming and Modern Farming in Agriculture

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Abstract

The backbone of India's economy is agriculture. The agriculture sector is also not free from the influence of the rapid growth of technology. This paper explores the changing nature of farming practices from traditional to modern farming in India. It provides an idea about how traditional methods that relied upon indigenous knowledge, organic inputs and natural processes have been supplemented by modern technology such as AI, mechanization and other digital tools. Through the comparison, the author highlights the benefits and challenges of modern agriculture including increased production rates, environmental concerns and growing need of technical expertise among farmers.

Keywords : agriculture, farming, traditional, modern, artificial intelligence.

Introduction

The role of agriculture in India's economy is pivotal with over 58% of the rural population relying on it as their primary source of livelihood (Gulati & Juneja, 2022). Contributing to approximately one-fourth of the Gross Domestic Product (GDP), agriculture remains a key sector today. The Green Revolution of the 1960s driven by

high-yield varieties (HYVs), irrigation expansion and chemical fertilizers marked a major shift in Indian farming practices transforming the country from one grappling with food shortages to becoming self-sufficient in food production. Today, with a market size of $400 billion, India stands as the world's largest producer of pulses, milk, and spices. It is also the second largest producer of tea, fruits, sugar, cotton, vegetables, rice and wheat (How Has Green Revolution Changed Agriculture In India - Agruculture Lore, n.d.).

In the present context India is a global player of agriculture production having a share of 2.2% in world agricultural trade (Agriculture Export Policy in India, n.d.). Though the majority of population depends on agriculture, the share of agriculture has been falling while the other two sector industry's and service sector's share is rising constantly. Around 54.5% population lives on only 18.8 percent of total income of the economy. Throughout history, there has been a profound relationship between Mother Earth and agriculture in India. For centuries, the agricultural sector has relied heavily on nature's rhythms and resources. However, with the rapid growth in population, the demand for increased food production has intensified. In response to this challenge, traditional farming methods are gradually giving way to new technologies that aim to make agriculture more efficient, productive and sustainable, balancing the needs of both people and the environment.

With population growth, environmental concerns and technological advancements, Indian agriculture continues to evolve, integrating modern scientific innovations with traditional practices. This transformation aligns with modernization theory which suggests that societies progress from traditional agrarian systems to industrialized economies through the adoption of new technologies (Rostow,1990). Traditionally Indian agriculture was subsistence based, labor-intensive and dependent on organic fertilizers and indigenous seeds. With the advent of mechanization high-yielding varieties, chemical inputs and data driven farming techniques, agriculture has become more commercialized. The increasing use of artificial intelligence (AI), exemplifies this shift. According to this theory, economic development necessitates agricultural modernization as outdated farming methods hinder progress. Furthermore, the Diffusion of Innovation Theory (Rogers, 1995) provides insights into how agricultural modernization spreads across different segments of the farming community. The adoption of hybrid seeds, sensor-based irrigation, and AI driven decision-making tools initially occurs among large commercial farmers and research institutions before diffusion to smaller farmers. Various factors such as government policies, financial support, accessibility of technology and farmers risk perception determine the rate at which these innovations spread. For eg. India's adoption of AI driven agricultural system has been uneven due to infrastructural challenges, digital literacy gaps and financial constraints among small farmers. In addition, the Sustainable livelihood framework (DFID,1999) provides a useful perspective on how Indian farmers navigate between traditional and modern farming to ensure economic stability and environmental sustainability. Traditional farming methods have been

characterized by organic fertilizers indigenous seeds and biodiversity conservation while modern agricultural methods introduce genetically modified crops, sensor-based irrigation and automated machinery to optimize productivity. Understanding these transitions helps assess the broader implications of agricultural modernization on farmers.

Objectives

The objectives of the paper are :

- To make a comparison between the traditional agriculture methods with modern methods
- To understand the implementation of AI in Agriculture
- To understand the change in production after using modern technologies

Methodology

A strong methodology is crucial for ensuring the credibility of research findings. This article employs a comparative and qualitative research approach to analyze the transition from traditional to modern farming in India. The study follows a descriptive comparative research design. Data are collected from various secondary sources like books, peer-reviewed journals, government reports and reliable online databases. Empirical study is done by analyzing government agricultural policies.

Traditional Farming Practices In India

Traditional farming practices in India have been the cornerstone of the country's agricultural heritage for centuries. They are characterized by a symbiotic relationship with nature, where farming techniques are adapted to the soil, climate, and bio-diversity. Traditional farming emphasizes sustainability, self-reliance and minimal environment impact. This approach not only ensures long-term health of the land, but also preserves the rich biodiversity that is essential for the resilience of ecosystems.

Agro-forestry :

Agro-forestry is an age-old practice of agriculture system in India, which involves the practices of tree plantations alongside crops. It has the potential of mitigating the effects of climate change, food security and crop productivity(Hamadani et al.). This practice enhances the soil quality, biodiversity and climate resilience increasing the farmer's income. A system of agro-forestry, known as silvopastoral sytem, is beneficial for livestock, in which leguminous fodder gasses are grown with trees (Reis et al.)((Isaac et al.), (Hamadani et al.).

Intercropping :

Intercropping is essentially a system of small and dry land farmers as it is a risk minimizing agriculture cropping system. Intercropping or mixed cropping involves cultivating two or more crop species simultaneously to optimize productivity (Brooker et al.). It enhances the productivity in any weather and climate condition and also it can reduce risk and uncertainty arising in the production of crops. The multi-cropping or inter-cropping provides about 15-20% of food supply for global population.

Crop rotation-based agriculture :

Crop rotation means the cultivation of two or more crops in a cyclic manner using same resources. It improves soil nutrient level, prevent soil degradation and act as a solution for scarcity of resources. It is a traditional practice, which is effective in the control of weeds, pests and disease (Patel et al.)

Livestock integrated agriculture practice :

Animal husbandry in agriculture is one of the oldest mainstays of cultivation in a tropical and developing country (Patel et al.). Current scenario indicates that a quarter of the global terrestrial land with the integration of animal husbandry produces almost one-tenth of the world's meat supply. It has historically played a vital role in Indian agriculture. Farmers integrate livestock for milk, meat, labor, and organic fertilizers, contributing to food security and sustainable farming (Patel et al.).

Shifting cultivation :

Shifting cultivation or jhum kheti also refers to as slash burn cultivation, which is a practice of growing crops on a land covered with ashes produced from burning trees. When the soil becomes exhausted the land left uncultivated and farmers shift their cultivation to another land and start with the same process. This method has been a way of life for many indigenous communities, particularly in North-East India. While effective for short term productivity, this method raises concerns regarding deforestation and soil erosion.

Modernization Agricultural Practices in India :

In the past, the agriculture activities were limited to food and crop production but in modern time it has includes processing, marketing distribution of crops and livestock products. In India agriculture activities generates employment, national income, provides raw material for other industries. Changing dimension of world economy and growing population now demand for more productive technology on this sector. Though the green revolution was the one step ahead of that traditional agriculture, it can't say that it was a viable solution for India as food in-adequacy has been a broad problem. It is believed that global population would hit by 10 billion by 2050 and to meet the population growth demands, global food production must increase 70% by 2050. In such situation modern farming is an emerging approach to agriculture which helps to increase productivity and reduce the number of natural resources required for agricultural production. Modernization of agriculture involves technological advancement, data-driven solutions and AI-based automation to increase efficiency and yield. Some modern farming systems use in agriculture sector in India are as follows :

Hydroponics and Aquaponics

These techniques are gaining popularity in urban and pre-urban areas, allowing for the cultivation of vegetables and herbs with minimal land use and water. Aquaponics

is a closed loop system that relies majorly on the symbolic relationship between aquaculture and agriculture for fertilization. This farming method combines conventional aquaculture with hydroponics. Hydroponics method doesn't require any type of soil. It is a method of growing plants without soil, using a nutrient-rich water solution to deliver essential minerals and nutrients directly to the plant's roots. The process involves growing healthy plants without the using of solid medium using mineral rich water for nutrients.

Organic farming **:**

Organic farming is an agricultural method that developed in response to rapidly evolving farming practices early in the 20th century. Compost manure, green manure, bone meal uses as an organic fertilizer. In this method biological management of pests, mixed production and the promotion of insect predators are encouraged. According to the Union Ministry and Farmer's Welfare, 2.78 million hectares of agricultural land had been cultivated organically. Madhya Pradesh tops the list with an area under organic farming of 0.76 million hectares, which is over 27% of the total organic farming area. Madhya Pradesh is followed by Rajasthan and Maharashtra on total area covered by organic farming.

Precision farming :

Precision farming or satellite farming involves satellite mapping, IoT devices and AI-driven data analytics to optimize crop management, irrigation and resource efficiency. It focuses on the observation calculation and response of crop intra-field and inter-field variability. The advent of GPS and GNSS has enabled the practice of precision agriculture. Data analytical tools help in making informed decision about crop management, predicting yields and managing risks like pests and disease. Precision farming can lead to higher productivity, resource efficiency and help farmers better cope with climate variability.

Genetic manipulation of crop plants :

Modern agriculture has taken advantage of the advancement in a large number of molecular breeding and a bio technological tool, crop productivity has been increased in recent past. Genetically modified crops are developed in in-vitro conditions by altering the genetic makeup of a host organism (Kale et al.). At commercial level the best-known common example of genetically modified crop (GM) crop in India is Bacillus Thuringiensis [kale et al.,2020]. The GM crop has been developed for bioremediation of tainted soil.

Introducing AI in farming as a modernization of agriculture sector

In modern times, farmers are becoming increasingly aware of the benefits of using artificial intelligence in agriculture to enhance productivity and profitability. Automation and AI-driven technologies are key solutions in addressing pressing social challenges such as ann aging farming population and declining workforce availability. However achieving the accuracy and complexity required for operations that were traditionally carried out by farmers to maintain high-quality produce remains a significant challenge

(Zha). Recently some state has introduced AI driven agricultural process. With *Sensor Device,* that check weather and soil health uses AI figures out when to water the crops which led to a near 25% boost in productivity on crops. Informed decision making is only one part of the solution to improve productivity, inefficiencies in the existing in conventional methods of agriculture. To provide actionable insights AI used as Sensors, Drones and satellite imagery to collect data on soil conditions, weather and pest infestations. AI tools using in agriculture can be used as a management of supply chain and planning for better yielding of crop. Introducing robotics in agriculture also increase in higher yielding. Automatic tractor, machine, drones perform tasks such as planting, weeding and harvesting with high efficiency. Artificial intelligence is the concept that can transform present day agriculture to more productive input model. Some uses of AI in agriculture process such as follows;

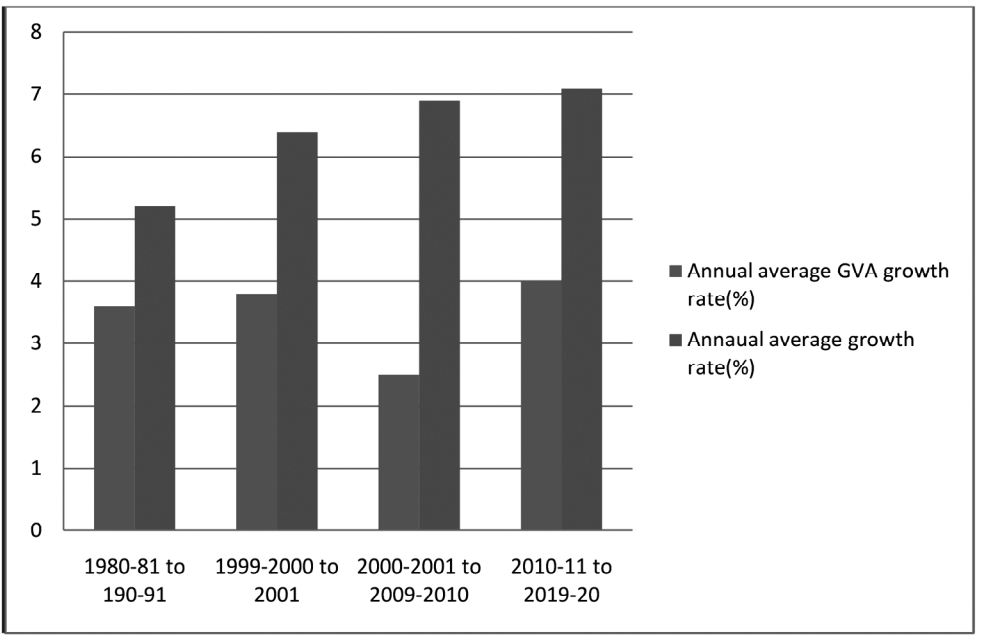
- **Crop health monitoring system :** AI facilitates identification of pests, disease and weeds problems and automated the management of these problems. AI also predict for future situation and enabled issues advisories for sowing, pests' control and commodity pricing. Remote sensing techniques, hyperspectral imaging and AI build crop health monitoring system use as tools for monitoring crop.
- **Smart irrigation system :** Smart irrigation system includes providing the actual quantity of water for right crop at the right time. In conventional method most of farmers are depends on rainwater but lake of proper irrigation the yielding was low comparative to the modern agriculture system. Using sensor based automated irrigation system issued associated with the low irrigation efficiency of Indian agriculture which is around 38% (Sinha et al.) can be resolved to greater extent.
- **Agricultural risk management :** There are a very high level of risk and uncertainty arising during the cultivation of crop. Uncertain drought, rain and other disease can affect the production of crop. In such situation AI based technologies support farmers in the management of risk and uncertainty by facilitates preparedness to the farmer.
- **Natural Language Processing for agricultural advisory :** India is a multi-lingual society and majority of farmers are illiterate. A lot of content failed to reach the desired people because of language problem and lake of human resource to convert it to the end user's language. This gap can effectively fill through natural language processing tools of AI.
- **Agriculture growth driven by IoT :** AI and information technology or sensor can be used to create intelligent system that can be embedded in machines to make it worth higher accuracy. IoT is an advancement built on several existing technology such as wireless sensor networks and cloud computing. IoT can be

applied in manifold fields such as monitoring, precision agriculture, tracking and tracing, greenhouse production and agricultural machinery. Tracking and tracing of agriculture product using IoT, agricultural companies make better decision.

A Transformative View On Indian Agriculture Sector

The share of agriculture in India's GDP is only 16.5%. The sector employs the largest share of workforce i.e. 42.3% in 2019. The structural transformation of Indian agriculture system leads India from food deficit nation to a marginally food supply one producing sufficient food for growing population. Now Indian agricultural system has transformed from a subsistence base and labor-intensive techniques to modernized, capital and knowledge intensive one. The expansive scope of digital techniques and technology in agriculture has ushered in a new era of innovation, minimizing losses and enhancing overall efficiency. The technological evolution is a boon for farmers for as the adoption off digital and analytic tools continues to drive ongoing improvements in agriculture. Following figure shows the annual average GDP growth rate and agricultural gross value added (GVA).

Fig 1: Average annual GDP growth rate and Agricultural GVA

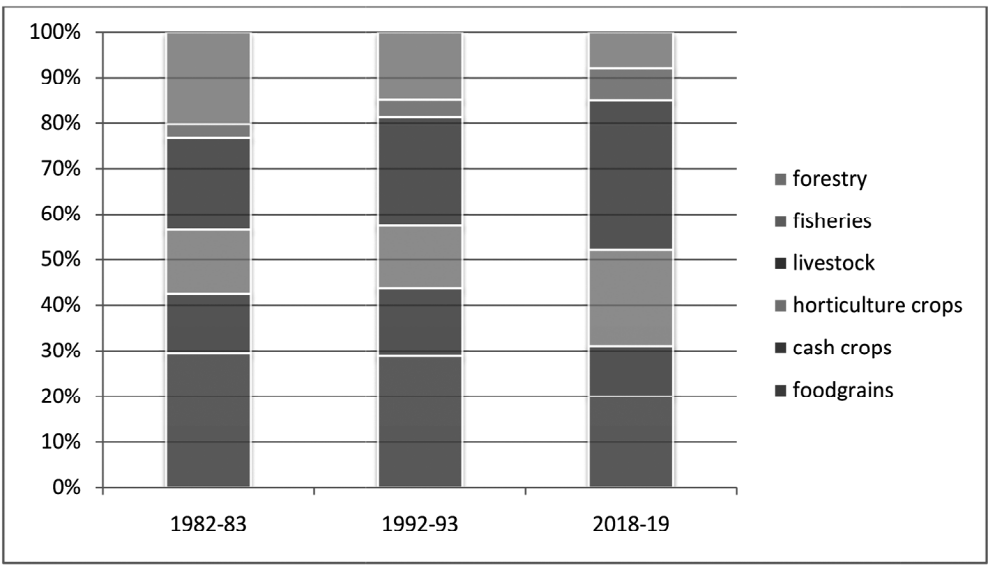


Source: National annual accounts, NSO 2019

From above data it has shown increasing trend of agricultural growth from 1980 to 2020. Recent agricultural practices facing the modernization of techniques, which induces the gross value of agriculture from 3.6% to 4% for the year 2019-20.

Traditionally the agriculture sector was engaged mostly on the production of food grain. Now farmers are moving towards more commercial crop. Though food gain still dominates large of the production, cash crop, horticulture livestock etc. other allied activities also growing rapidly with the use of high productive technology. Fig 2 presents these changing shares over the period for 1982 to 2018-19.

Fig2 : changing cropping pattern in values of output (percentage)



Source: National Accounts Statistics, NSO, 2019.

The figure clearly represents the transition agricultural cropping pattern from 1982 to 2018-19. Farmers are moving away from staple crops to cash crops. In 1982-83 foodgrains production was 29% and it decline to 20% by 2018-19. Reduction of foodgrains resulting the increase in production of cash crops like oilseeds, sugarcane fibers and horticulture crops include vegetables, fruits and floriculture and spices etc.

Conclusion :

Agriculture in India has witnessed a rapid growth trajectory, tacking the country from food deficit to largest exporter of food grains with the production of 292 MMT in 2019-20. The scenario has changed from old aged period to modern time because of impressive development and adoption of modern technologies, investment and use of AI tools for cropping and food processing. Notwithstanding for the economic success the sector is path way with various opportunities. Sectoral contribution to the overall GDP has declined to 16.5 % even it still employs almost 42.3% of the total workforce (Gulati and Juneja). This paper has only dealt with the changing pattern of farming system with the use of modern technology. The new methods with the help of modern irrigation system, HYV seeds, chemical fertilizers have increased productivity.

Agriculture in modern days have become more commercial and market oriented. Future research should focus on balancing technological advancements with sustainable practices to ensure long-term food security and environment resilience in India.

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Synergistic Ontologies and Eco-Cosmological Paradigms : Deconstructing Traditional Knowledge Systems in Koral Dasgupta's *Tara*

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Abstract :

In the Indian context, the Traditional Knowledge System encompasses wide ranging ideas of traditional, cultural, philosophical and scientific knowledge of the Indian sub-continent. Many such ideas are found reflected in Indian Writing in English of the 21st Century. Often, the novels are a blend of wisdom and contemporary reality which showcases the relevance of traditional knowledge in the contemporary world. Retelling mythological texts is a powerful tool which helps in preserving the traditional knowledge system by showcasing their relevance in contemporary times. In the 21st Century, mythological tales like *The Ramayana* and *The Mahabharata* are frequently reimagined. The main aim of this paper is to look into how Koral Dasgupta in her novel *Tara* (2024) explores the themes of existence, environment and universe in relation to traditional knowledge systems and how these ideas are relevant even in the contemporary times.

Keywords : *contemporary, existence, fiction, knowledge, traditional.*

Introduction :

Traditional Knowledge System and Contemporary Indian Writing in English:

In the Indian context, the Traditional Knowledge System encompasses wide ranging ideas of traditional, cultural, philosophical and scientific knowledge of the Indian sub-continent. Many such ideas are found reflected in Indian Writing in English of the

21st Century. Often, the novels are a blend of wisdom and contemporary reality which showcases the relevance of traditional knowledge in the contemporary world. Novels such as Chitra Banerjee Divakaruni's *The Palace of Illusions* (2008) is a retelling of *The Mahabharata* from Draupadi's perspective and deals with ideas related to dharma, cultural and religious practices and the role of women in society. Madhuri Banerjee's *Mistakes like Love and Sex* (2012) touches upon themes of traditional healing practices rooted in the Indian tradition. Amitav Ghosh's *The Hungry Tide* (2004) and *The Great Derangement* (2016) explores ideas of ecological wisdom of the indigenous communities portraying the relationship between human and nature as an integral tool in traditional knowledge system. Arvind Adiga's *The White Tiger* (2008) and Anand Neelkantan's *Asura: Tale of Vanquished* (2012) offers a critique of the caste system thereby reflecting the continuing influence of traditional Indian social structures on contemporary life.

Retelling mythological texts on the other hand, is a powerful tool which helps in preserving the traditional knowledge system by showcasing their relevance in contemporary times. In the 21st Century, mythological tales like *The Ramayana* and *The Mahabharata* are frequently reimagined. In *The Shiva Trilogy* and *The Ramchandra Series*, Amish Tripathi reinterprets Hindu mythology through a modern lens-thereby making ancient knowledge accessible to the contemporary readers. Authors like Devdutt Pattanaik often draw from mythological tales and contribute to the preservation of these narratives. The main aim of this paper is to explore how Koral Dasgupta in her novel *Tara* (2024) explores the themes of existence, environment and universe in relation to traditional knowledge systems and how these ideas are relevant even in the contemporary times.

Objectives :

The main objective(s) of the paper is to figure out the role of environmental sustainability and stewardship, discuss the role of traditional medicine and healing practices, locate the philosophical dimensions of evil and comprehend the notion of the spirit world in the context of traditional knowledge systems in the novel *Tara* (2024) by Koral Dasgupta.

Methodology :

This paper is based on a qualitative analysis and a close reading of the novel *Tara* (2024) – fifth novel of the Sati Series by Koral Dasgupta and thereby locate ideas of traditional knowledge system in the novel.

Discussion :

I. Exploring Ecological Responsibility:

Tara embodies a connection to Nature on both physical as well as the spiritual level. Being a part of Kiskindha, she is portrayed as the one who is in harmony with Nature and the surroundings she has grown up in. This connection, though it is a part of her present being,–has been passed down to her through generations of cultural heritage. The setting of the plot Kiskindha, underscores the importance of living in harmony with nature. In *Tara*, the forest is presented to the readers not just as a setting

but as a symbol of life and its continuity. Tara mentions how "the forest of Kiskindha breathes like a living entity, its ancient trees holding the secrets of life's eternal cycle – birth, decay, and rebirth" (133) she also comments "In Kiskindha, I learnt sustenance" (133). This emphasizes the forest as a symbol of life's resilience and continuity, reflecting the cyclical nature of existence. This symbolic significance of the forest is rooted deeply in the collective psychology and cultural consciousness of the residents of Kiskindha which is passed down from one generation to the next. Indigenous Knowledge Systems typically emphasize on the preservation of the environment. These systems are rooted in the traditional wisdom of indigenous communities, preserved over generations through their direct contact and interaction with the environment. Indigenous communities often undertake practices such as farming, fishing and hunting as well as gathering that are tailored to meet the community's needs without pushing the resources to the mouth of depletion and exhaustion, thereby ensuring that the resources are available for future generations. To promote this idea, the inmates of Kiskindha are seen to follow sustainable practices in their daily lives. They engage themselves in rotational farming, alternative cultivation and selective harvesting, ensuring that the forest does not exhaust its natural resources. Alongside promoting ideas of sustainability, indigenous knowledge system also promotes ideas of environmental stewardship. According to the U.S. Environmental Protection Agency, environmental stewardship is defined as – the responsibility for environmental quality shared by all those whose actions affect the environment. This sense of responsibility is a value that can be reflected through the choices of individuals, companies, communities, and government organizations, and shaped by unique environmental, social, and economic interests. It is also a behavior, one demonstrated through continuous improvement of environmental performance, and a commitment to efficient use of natural resources, protection of ecosystems, and, where applicable, ensuring a baseline of compliance with environmental requirements.

In the novel, Tara's approach to sustainability is based on the profound respect for nature and her understanding that the lives of all living beings-both human and the non-human are interconnected. She believes that a being's existence is possible only when it is in harmony with other forms of beings in the environment it is placed in; that the well-being of any being is directly connected to the well-being of Nature and environment. In the novel, Tara is depicted as a character who understands the delicate balance of ecosystems and the need to preserve them for the future generations.Tara states, "A forest fire had broken out on the outskirts of Kiskindha, and it was spreading fast. Our land, along with its residents, would be wiped out if the calamity was not contained right away" (18). This was when under the leadership of Tara, the 'vanar women' rushed out to collect water from river Pampa and douse the fire that "seemed to have opened its mouth with demonic hunger" (18). Tara prays to Mother Earth, "Forgive me, Mother Earth. We need to survive. We need resources. We have no other way" (18). This statement of Tara highlights the importance of environment and its preservation for the present as well as the upcoming generations which includes a careful management

of the natural resources, waste management and focus on renewal and regeneration. Not only Tara, but characters like Bali also highlight the necessity of preservation. During their search for edibles in the forest of Kiskindha, when Sugreev declared to uproot a group of "useless plants" (20), Bali spoke sternly stating that every plant must remain in their given space. Bali foresees the future and states in the affirmative, "Mark my words, brother. Someday, in a moment of great crisis, these plants will provide crucial relief. Thank me then" (20).For Tara, sustainability and environmental stewardship is not just a practical approach to life but it also holds a deep spiritual and cultural one. Since her ideas are rooted in indigenous beliefs that see the earth as sacred and all living beings a part of the larger, interconnected community,Tara upholds the philosophy of 'Advaita Vedanta'. The philosophy of Advaita Vedanta which is a part of Hindu sâdhanâ and spiritual discipline, upholds the idea of non-dualism, a oneness in multiplicity and thereby understands the importance of peaceful coexistence of the community at large. Since traditional knowledge systems emphasize on the idea that all living beings are a part of the larger ecosystem, therefore the pillar of coexistence in nature is an important phenomenon in this regard. Interestingly, the narrative offers interesting worldviews of the brothers Bali and Sugreev when it comes to the idea of peaceful coexistence in Kiskindha. Bali, the powerful and dominant ruler of the kingdom views the forest as a space to assert his authority and control. For Bali, coexistence in the forest is only possible when the space is governed and protected using strength and might. Bali's leadership is characterized by an expectation of absolute loyalty and obedience from his subjects. Bali presents a more utilitarian approach to the spirit of coexistence. He strongly believes that order and decorum can only be maintained in the forest when others submit to his authority, where he is at the top of the hierarchy. Bali's concept of coexistence therefore is hierarchical. Sugreev presents a more egalitarian and harmonious approach to the notion of coexistence in the forest. Unlike his elder brother, Sugreev does not view the given space as a territory to be ruled but as a community where all beings can coexist with mutual respect. His idea of the forest is more inclusive and nurturing and thus after the supposed death of Bali, when Sugreev takes up the role of the ruler of Kiskindha, he allows animals of other territories to settle in Kiskindha and be a part of the kingdom besides monkeys, bears and birds. Sugreev desires a community of interconnected beings where coexistence is based on mutual respect and collaboration.

II. Traditional Medicine and Healing Practices :

The World Health Organization (WHO) defines traditional medicinal knowledge as "the total sum of knowledge, skills and practices that are based on the theories, beliefs and experiences of indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the preservation, diagnosis, improvement or treatment of physical and mental illness". In the novel, Koral Dasgupta presents the characters of Sushena and Ruma as practitioners of traditional medicine, characters that embody the knowledge and wisdom of healing practices that are chiefly rooted in the natural world, based on the power of herbs and plants-practices to rejuvenate the

settle matters of health-both physical as well as spiritual. Traditional medicine and healing practices hold a significant place in cultural identity with relation to indigenous knowledge systems. Rooted in ideas of centuries of old practices, traditional medicine represent a holistic approach to health. These practices are mostly passed down from one generation to the next and rely on the wealth of knowledge about local flora and fauna. In traditional medicine and healing practices, natural resources such as herbs, shrubs, plants and minerals are often seen and believed to possess intrinsic healing properties. Therefore, these practices also promote ideas of preservation since it looks mainly into how to identify medicinal plants, harvest them and prepare remedies to cure a cause.

Ruma, a key figure in the story, is presented as a healer, the disciple of Sushena (the skilled physician of Kiskindha). Along with Sushena, Ruma practices traditional medicine and is portrayed as a healer with the knowledge of medicinal properties of various plants found in the forest. Along with Sushena, she builds up a laboratory in Kiskindha which only a few people has access to. Ruma upholds the philosophy that the human body is a part of the natural world and therefore the solutions to problems can be found in nature itself. Ruma focuses not just on treating the physical ailments of the wounded, but also focuses on restoring the balance of the body and the mind. Her methods are therefore holistic which highlights a broader understanding of health that goes beyond the physical, encompassing the mental, emotional as well as the spiritual well-being of individuals. Ruma not only a provider of traditional medicines to the needy but is also a caregiver where she is seen as nurturing her patients with compassion and empathy. Sushena on the other hand, is the character who wishes to pass down this practice to the new generation but fails miserably when it comes to her own daughter-Tara. Even Tara is aware of this when she states, "Everyone in the forest thinks I'm a spoilt brat, born to bury the fame of her father deep in sand" (74). Sushena's role in the narrative is chiefly the transmission of the knowledge of traditional medicine and healing practices, thereby maintain the health and well-being of the entire community of Kiskindha. His focus is not confined to curing ailments and treating the needy but it is to pass down the information to the future generations in order to preserve ideas of traditional medicine. Thus, with Ruma he finds a quality disciple. Sushena is described as an old healer, carrying an expertise in traditional medicine. Sugreev calls him "a doctor" (20). Both Ruma and Sushena's approach to medicine includes a careful observation, diagnosis and the use of natural remedies to treat ailments of the body. Their approach to medicine is thus methodical-based purely on the understanding of the human body, its relationship with the environment and locating solutions to treat ailments from the environment itself. From Kiskindha to Rishyamukh, both Ruma and Sushena tries to locate important medicinal plants which will be beneficial for the community at large. Not only figuring out the plants but they also work together to find the medicinal properties of the flora. Ruma states, Ashwagandha mixed with eucalyptus extract and tulsi leaves can reduce exhaustion and reenergize miraculously. Vanjula flowers added to the mixture will cleanse the stomach. I heard the sages dwelling at

Rishyamukh discussing vanjula. Ashwagandha plants grow sporadically in the far west of the forest. Eucalyptus and tulsi are in abundance. (41)

Also, regarding 'datura flower', Ruma states, "An overdose of datura can cause blurred vision, hallucinations, anxiety or fever, leading to brain hemorrhage" (75). In the contemporary era, as the world grapples with challenges of environmental degradation and limitations to conventional medicine, there is a growing interest in the world and wisdom put forward by indigenous knowledge systems. The depiction of practices carried out by Ruma under the guidance of her mentor Sushena depicts the necessity of upholding traditional medicine based on a deep reverence for nature. Their approach to healing is characterized by a reliance on natural resources and an understanding of the fact that the human body is an integral part of the natural world. The novel not only highlights the importance of traditional medicine as a part of the indigenous knowledge system but also portrays these medicinal practices as a form of resistance-resistance to colonial practices, resistance to the encroachment of modernity and resistance to the erosion of traditional knowledge. The practices carried out by Ruma and Sushena are not only showcased to be effective but are also respected and deeply valued by the community which symbolizes the fact that tradition is honoured and it continues to hold relevance in the community. It is through the characters of Ruma and Sushena that Koral Dasgupta highlights the importance of preserving the indigenous knowledge.

III. The Ontology of Malevolence: Analyzing Philosophical Dimensions of Evil :

In the novel, the characters of Dunduvi and Mayavi represent the aspect of malevolence-they symbolize evil and represent the disruption of the natural order. They also reflect the complex moral choices and the disturbance of balance in the story. From a philosophical standpoint, their actions serve as significant tools for exploring the concept of evil in indigenous knowledge systems. In the novel, the characters of Dunduvi and Mayavi serve more than antagonist. Their characters serve to explore the nature of evil and the consequences of 'adharma' as opposed to the pillar of 'dharma' in Indian philosophy. In the context of ethics, therefore, evil is associated with adharma- the actions that defy moral and cosmic order. Though upholding dharma is essential to maintain social harmony, the element of evil is often seen as disrupting this balance. In Indian philosophy, the school of 'Dvaita' accepts the existence of opposing forces-the good and the evil, both operating in the cosmic universe. Together, Dunduvi and Mayavi represent the nature of evil as opposed to the forces of the benevolent. Dunduvi represents the overt and destructive force that cause havoc to beings- a brutal force characterized by extreme violence, aggression and a blatant disregard for dharma. From time to time Dunduvi makes an appearance and disrupts the normal balance of the ecosystem. Since Dunduvi's action put him in direct conflict with the principles of dharma his actions therefore situate him as the antagonist of the story. The narrative positions Dunduvi as a test of moral fortitude for other characters. The resistance against this force signifies the struggle to uphold the torch of dharma and righteousness. From the traditional view of

evil, Dunduvi is a force that must not only be confronted but must also be defeated in order to restore peace and harmony to individuals and community. In the final stage of his appearance, Dunduvi is seen changing his form to a humongous charging bull and is described as, "the mad bull ploughed through the vegetable patch, goring the children on the way with its fierce horns, relentlessly chasing Lali" (186). The story also brings to the foreground the idea of 'inevitability of karmic retribution'. Dunduvi's downfall reinforces the idea that adharma cannot sustain itself and it must be defeated. This defeat comes from Bali during the final confrontation. Bali "had lifted Dunduvi above his head with both hands, his mouth unleashing a barrage of ghastly profanities. Dunduvi lay dead between his hands, his head smashed by the mace, fragments of bones falling off" (188).

Mayavi on the other hand, is often associated with the idea of evil that is subtle and manipulative, not overt and brutal. Mayavi-the brother of Dunduvi represents 'maya' or illusion which again, leads individuals astray from the path of dharma. He is the character that has the power to distort reality, making it difficult for individuals to discern right from wrong. His character challenges the traditional understanding of evil as a force that is overtly negative but is portrayed as a force that operates from the grey areas of human experience. Mayavi's character, like that of Dunduvi also suggests that no matter how elusive and strong the negative force is, no matter how cleverly concealed, in the face of dharma, it is bound to undergo a downfall. Though Mayavi is able to create an illusion of the death of Bali during the battle, which places Sugreev as the ruler of Kiskindha, he is mortally wounded by Bali after a battle which lasts for several years. Thus, together, both Mayavi and Dunduvi represent aspects of evil and its dual nature- one overtly destructive and the other subtle, working under concealed face. Both the characters highlight the fact that the nature of evil is not always in black and white, it has shades of grey as well and though evil can manifest in several ways, it needs to be recognized and resisted. Both the instances of Dunduvi and Mayavi serve as moral lessons in indigenous knowledge systems:- lessons about adharma and the importance of adhering to dharma. The fate of both these characters serves as a strong reminder of the inevitable karmic force- the cosmic justice that governs the universe.

IV. Bridging Realms: Exploring Connections with the Spirit World :

The spirit world holds a profound significance in indigenous knowledge system which serves as an element of interconnectedness of species and all life forms. Several indigenous cultures such as Australian aboriginal cultures, Native American cultures such as Lakota and Navajo tribe, Maori culture and Yoruba culture, views the spirit world as an integral part of the daily life. The spirit world which encompasses ancestors, deities and other spiritual entities, guide and influence the material world. The belief in the spirit world plays a crucial role in the maintenance of cultural continuity and fosters a deep respect for nature. The connection with the spirit world also serves as a tool for the transmission of knowledge across generations. In *Tara*, the presence of the spirit world has significant philosophical implications. It is the spirit of Bali (after his death) whose presence in the narrative symbolize the continuity of life even beyond death. In

indigenous knowledge traditions life and death is seen as a part of a continuous cycle where the spirits of the dead remain an integral part of the community. In the narrative, Bali's spirit suggests that the dead continues to influence and guide the living. Also from the narrative point of view, interactions with Bali's spirit fills up the narrative gaps. It is through these interactions with Bali, Tara gains a moral and ethical guidance from time to time. The bigger narrative of *The Ramayana* is narrated by Bali to Tara only after his death. This is where Tara learns about the events and conflicts from Ayodhya to Lanka-it is Bali's spirit that communicated to Tara about how "Ram has achieved victory. Ravan is defeated. Sita is back" (23) but he also states how "as Ravan's pyre burns on the other side, there is fire on this side too" (23) which Sita has to undertake-a walk "through the flames" (24) to prove her chastity. Bali's spirit also narrates the duel with Mayavi and thereby fills up the gaps in the narrative. It is through the communication with Bali's spirit that Tara finds solace and solutions to her dilemmas.

Conclusion :

The retelling of mythological texts serves as a vital link between the past and the present, thereby highlighting the relevance of traditional knowledge system. These stories not only helps to preserve ancient wisdom but also look into the ideas of philosophical insights, ecological knowledge and various cultural practices by making them available to the readers. And through this process, the timeless ideas continue to thrive, inform and inspire the future generations.

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বিপন্ন মানুষজাতির কথা ঃ প্রসঙ্গ তিলোত্তমা মজুমদারের ছোটগল্প

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সহকারী অধ্যাপক ও বিভাগীয় প্রধান
বাংলা ভাষা ও সাহিত্য বিভাগ, দুলিয়াজান মহাবিদ্যালয়

প্রবন্ধের সার সংক্ষেপ ঃ

আধুনিক কথাসাহিত্য তথা ছোটগল্প মানবজীবন নির্ভর। মানুষজাতির কথা-ই সেখানে বেশিমাত্রায় প্রাধান্য লাভ করেছে। সেই সঙ্গে আধুনিক মানুষের জীবনের নানা সংকট এবং তা থেকে উত্তরণের চিত্র সেখানে প্রতিফলিত হয়েছে। বিচিত্র জীবন পরিসরের মধ্যেকার এই সংকট মানবজাতির বিপন্নতাকে সূচিত করে। আধুনিক বাংলা ছোটগল্প পাঠ করতে গিয়ে আমরা দেখি, ছোটগল্পকার তিলোত্তমা মজুমদারের ছোটগল্পগুলির মধ্যে সেই বিপন্ন মানবজাতির কথা উঠে এসেছে। সাহিত্য রচনার ক্ষেত্রে প্রথম থেকেই দেখা যায়, মানুষের জীবন নিয়ে কাহিনি বুননে তাঁর বিচিত্র জীবনদর্শন ধরা পড়ে। তাঁর ছোটগল্পের মানুষেরা সেখানে ভিন্ন জনপদ থেকে উঠে আসে। ফলত তাদের মধ্যে যে — সামাজিক বিপন্নতা আমাদের দৃষ্টিগোচর হয়, তার মধ্যেও বৈচিত্র্য লক্ষ করা যায়। মানবজীবনের এই বিপন্নতা চিরন্তন। ভারতীয় ঐতিহ্যবাহী জ্ঞানের পরিসরে মানুষজাতির এই চিরন্তন বিপন্নতা অবশ্যই আলোচনার দাবি রাখে। তাই আমাদের এই প্রবন্ধের বর্ণিতব্য বিষয় হল 'বিপন্ন মানুষজাতির কথা'। তিলোত্তমা মজুমদারের নির্বাচিত পাঁচটি ছোটগল্পকে প্রসঙ্গ হিসেবে ধরে নিয়ে উল্লিখিত বিষয়টিকে এই গবেষণাধর্মী আলোচনায় বিশ্লেষণ করা হবে।

বীজ শব্দ ঃ

ঋগ্বেদ, তিলোত্তমা মজুমদার, বাংলা ছোটগল্প, বিপন্নতা, মানুষ, সমাজজীবন

১.০০ ভূমিকা ঃ

'বিপন্ন' শব্দটির আভিধানিক অর্থ হল বিপদে পতিত, অর্থাৎ বিপদগ্রস্ত। মানবজীবনের যে-কোনও সংকটপূর্ণ অবস্থা বোঝাতে 'বিপন্ন' শব্দটি প্রয়োগ করা হয়। আমরা সকলেই জানি, সমাজ কথাটির সঙ্গে মানুষের বেঁচে থাকার আশা-আকাঙ্খা অঙ্গাঙ্গিভাবে জড়িয়ে আছে। সুস্থ জীবন-যাপন করার অভিপ্রায় নিয়েই মানুষ একসময়

আদিম সমাজর বিপন্নতা থেকে সভ্য সমাজে সরে এসেছিল। কিন্তু সেখানেও মানুষ সম্পূর্ণ নিরাপত্তাহীনভাবে জীবন অতিবাহিত করতে পারেনি। প্রাচীন যুগ থেকেই সাহিত্য এই সমাজের কথা বলে এসেছে। দেব-নিয়ন্ত্রিত মধ্যযুগেও এর ব্যতিক্রম ঘটেনি। তবে আধুনিক যুগে এসে সাহিত্য আরও বেশি সমাজ-নির্ভর হয়ে উঠেছে। এই সমাজ মানুষকে নিয়ে এবং মানুষের জন্য গঠিত। বাঁচার তাগিদের ওপর নির্ভর করে যেমন তা গড়ে উঠেছে, তেমন এই বাঁচার তাগিদই মানুষকে ক্রমশ বিপন্ন করে তুলেছে। আধুনিক বাংলা ছোটগল্পে মানুষের সেই বিপন্নতার কথা বর্ণিত হয়েছে।

১.০১ গবেষণার উদ্দেশ্য ঃ

বাংলা সাহিত্যে কথাসাহিত্যিক তিলোত্তমা মজুমদারের বহুল পরিচিতি রয়েছে। তবে উপন্যাস-সাহিত্যের জন্য তিনি যতটা জনপ্রিয়, ছোটগল্পের ক্ষেত্রে তুলনায় তাঁর পাঠকপ্রিয়তা কম। অথচ ছোটগল্পে তাঁর বিচিত্র জীবনদর্শন প্রতিফলিত হয়েছে। মানবজীবন থেকে উপাদান সংগ্রহ করে তিনি এযাবৎ কাল যত ছোটগল্প লিখেছেন, দেখা গেছে মানুষই সেখানে শেষ কথা। অনিশ্চয় জীবনের প্রবহমানতায় তিলোত্তমা মজুমদার লক্ষ করেছেন, নানা সংকট মানুষকে নানাভাবে বিপন্ন করে তোলে। তাঁর সাহিত্যজীবনের প্রথমদিকের পাঁচটি ছোটগল্প অবলম্বনে মানবজীবনের বিপন্নতার স্বরূপোদ্‌ঘাটনই এই গবেষণার মূল উদ্দেশ্য।

১.০২ সাহিত্যিক পর্যালোচনা ঃ

আধুনিক জনজীবন সংকটপূর্ণ। নানা দিক থেকে মানুষজাতি ঘোরতর বিপন্ন। এই বিষয়ে গবেষণা করতে গিয়ে আধুনিক বাংলা ছোটগল্পকার তিলোত্তমা মজুমদারের ছোটগল্পকে নির্বাচন করা হয়েছে। আমাদের এই গবেষণার পূর্বে তিলোত্তমা মজুমদারের ছোটগল্প নিয়ে দু-চারটি প্রবন্ধের সন্ধান পাওয়া গেছে যদিও, জনৈক প্রাবন্ধিকেরা সেখানে নারীকেন্দ্রিক আলোচনায় তাঁদের আলোচনাকে সীমাবদ্ধ রেখেছেন। মানবজীবনের বিপন্নতার স্বর সেই প্রবন্ধগুলিতে উচ্চারিত হয়নি। প্রসঙ্গত উল্লেখ্য যে, 'ডোমনি' ব্যতিরেকে আমাদের নির্বাচিত বাকি ছোটগল্পগুলি সেই সমস্ত প্রবন্ধে প্রায় অনালোচিত থেকেছে। নানা দিক থেকে আলোচনার সম্ভাবনা থাকলেও নির্ধারিত বিষয়ের ওপর গুরুত্ব দিয়ে তিলোত্তমা মজুমদারের ছোটগল্পগুলি এই প্রবন্ধে আলোচনা করা হয়েছে।

১.০৩ গবেষণা-পদ্ধতি ঃ

মানবজীবন বেশিরভাগ ক্ষেত্রে পরিস্থিতির ওপর নির্ভর করে চলে। এই পরিস্থিতি তার জীবনে নানা ঘটনার জন্ম দেয়। সাহিত্যজগতে সাহিত্যিকেরা সেই ঘটনাগুলিকে শিল্পসম্মত রূপ দিতে চেষ্টা করেন। আধুনিক ছোটগল্প তাই অনেক ক্ষেত্রেই ঘটনা-নির্ভর, যে — ঘটনাকে নির্ভর করে কখনও ছোটগল্পের কাহিনি তথা প্লট গড়ে ওঠে। তিলোত্তমা মজুমদারের ছোটগল্পগুলিও তা থেকে ব্যতিক্রম নয়। তাঁর ছোটগল্প নিয়ে গবেষণায় অগ্রসর হতে গিয়ে আমরা বর্ণনামূলক এবং বিশ্লেষণাত্মক পদ্ধতি অবলম্বন করেছি। এখানে বর্ণনামূলক পদ্ধতি সহযোগে ঘটনা বা পরিস্থিতির বর্ণনা দেওয়া হয়েছে। অন্যদিকে বিশ্লেষণাত্মক পদ্ধতির সাহায্যে ঘটনাগুলির কারণ এবং মানবজীবনের সঙ্গে তার সম্পর্ক খোঁজার ও সেই বিষয়ে ব্যাখ্যা দেওয়ার চেষ্টা রয়েছে।

১.০৪ গবেষণার উৎস ও সীমাবদ্ধতা ঃ

তিলোত্তমা মজুমদারের ছোটগল্পে প্রতিফলিত 'বিপন্ন মানুষজাতির কথা' বিষয়ে গবেষণা করতে গিয়ে মুখ্য উৎস হিসেবে তিলোত্তমা মজুমদারের 'ঋ' (২০০৩) সংকলনটিকে বেছে নেওয়া হয়েছে। অন্যদিকে গৌণ উৎস হিসেবে প্রাচীন ভারতীয় সমাজব্যবস্থায় মানবজীবনের বিপন্নতার প্রসঙ্গ আলোচনায় সুকুমারী

ভট্টাচার্যের 'প্রাচীন ভারত ঃ সমাজ ও সাহিত্য' (১৩৯৪) গ্রন্থে উল্লিখিত 'ঋগ্বেদের দিনের মানুষ' প্রবন্ধটিকে গুরুত্ব দেওয়া হয়েছে। নারীকেন্দ্রিক আলোচনার বাইরে তিলোত্তমা মজুমদারের ছোটগল্প নিয়ে তেমন কোনও আলোচনা পাওয়া যায়নি, তাই আমাদের গবেষণায় মুখ্য উৎসের ওপর বেশি গুরুত্ব আরোপ করা হয়েছে।

২.০০ মূল আলোচনা ঃ

সমাজ এবং সভ্যতা নিয়েই সাহিত্যের কারবারি। নিজস্ব সৃজন কৌশলের সাহায্যে সাহিত্যিক তাঁর চোখে দেখা সমাজ এবং সমাজভাবনাকে সাহিত্যের মধ্যে প্রতিফলিত করার চেষ্টা করেন। অন্যদিকে সভ্যতা বলতে আমরা সভ্য সমাজকে বুঝি। সাহিত্যের ক্ষেত্রে বেদ তথা 'ঋগ্বেদ-সংহিতা'য় ভারতবর্ষের প্রাচীন সভ্যতার পরিচয় লিপিবদ্ধ আছে। কল্পনা-নির্ভর হয়ে আমরা এই গ্রন্থ থেকে সভ্য সমাজের উদাহরণ খুঁজে নিই। তৎকালীন সমাজের পূর্ণচিত্র না থাকলেও প্রত্যক্ষ কিংবা অপ্রত্যক্ষভাবে সামাজিক মানুষের জীবনই সেখানে প্রতিফলিত হয়েছে। অস্পষ্ট, অনুমাননির্ভর হলেও ঋগ্বেদে সমাজের যেটুকু ছবি ফুটে উঠেছে প্রাবন্ধিক সুকুমারী ভট্টাচার্যের ভাষায় তা, 'অপেক্ষাকৃত বিদ্বান্ ও বিত্তশালীরই চিত্র।'[১]

আর্যরা এদেশে এসে প্রাগার্যদের কাছ থেকে শিক্ষাগ্রহণ করে কৃষিজীবী হয়ে উঠে বিক্ষিপ্ত ছোট ছোট শহর পত্তন করে নগর-কেন্দ্রিক গ্রামীণ জনপদের বিস্তার ঘটায়। কিন্তু আশ্চর্যজনকভাবে আমরা ঋগ্বেদে প্রাগার্যদের উপেক্ষিত হতে দেখি। তবে প্রাগার্য তথা অনার্যদের উপেক্ষা করা হলেও যাদের জীবনকথায় বৈদিক সমাজকে আমাদের আদর্শবান, পাপবিহীন, সর্বসুখময় বলে মনে হয়, প্রকৃতপক্ষে তা ছিল আপাতসভ্য; কেননা প্রাবন্ধিকের মতানুযায়ী ঋগ্বেদ-সংহিতায় চিত্রিত সমাজে ভারতীয়-মানসলোকে উদিত সমাজের কল্পরূপের কোনও সমর্থন নেই। আদর্শবাদ থাকলেও মানুষকে তুচ্ছ-তাচ্ছিল্য করা থেকে শুরু করে চুরি, ডাকাতি, জুয়াড়ি, শঠতা, ক্রূরতা, ব্যসন, প্রতিহিংসা, প্রতারণা ইত্যাদি সবকিছুই আর্যসভ্যতায় বর্তমান ছিল। এমনকী কার্যোদ্ধারের নিমিত্তে এরা দেবতাকে প্রলোভন যেমন দেখাত, তেমনি এদের দেবতারাও সেই প্রলোভনে প্রলুব্ধ হতেন। এই কথাগুলি বলার কারণ হল, আধুনিক সমাজে এসে ভারতীয় ঐতিহ্যবাহী জ্ঞানের পরিদৃশ্যে আমরা মনুষ্যজাতির যে — বিপন্নতা তথা সংকটপূর্ণ জীবনের কথা বলতে চাই তা বৈদিক যুগ থেকেই সমাজে বর্তমান ছিল। প্রাবন্ধিক অবশেষে এও বলতে চেয়েছেন যে, মধ্যযুগের শেষে এসেও মানুষ যখন সন্তানের ক্ষুধা নিবৃত্তির জন্য ঈশ্বরের কাছে আকুতি প্রকাশ করেছে, তাতে তার মননের ক্ষুণ্ণিবৃত্তিও সে অপরিহার্যরূপেই চেয়েছে; অভাব্য জীবনকে পূর্ণভাবে জানতে বুঝতে ও উপভোগ করতে চেয়েছে। আধুনিক যুগে রবীন্দ্রনাথ ঠাকুরের মধ্যেও সেই আকাঙ্খা বর্তমান।[২]

তিনহাজার বছর আগে 'ঋগ্বেদ-সংহিতা'য় লেখা হয়েছে — 'জীবাতবে ন মৃত্যবে' (১০/৬০/১০); অর্থাৎ জীবনের লক্ষ্য বাঁচার জন্যে, মরবার জন্যে এ-জীবন নয়।[৩] আদিম কাল তথা সুপ্রাচীন কাল থেকেই মানুষের মধ্যে বাঁচার তথা জীবনকে উপভোগের ইচ্ছে বর্তমান। এই নিগূঢ় সত্য মনবমনের অবচেতন স্তরে প্রোথিত রয়েছে। ইচ্ছেপূরণের লড়াইয়ের মধ্যেই প্রকৃতপক্ষে মানুষ বেঁচে থাকে। কিন্তু এই লড়াইয়ের আগে, পরে, এমনকী মধ্যভাগে তথা লড়াই চলাকালীন মানুষ নানা ধরনের বিপদের সম্মুখীন হয়। সামাজিক, রাজনৈতিক, অর্থনৈতিক সংকটে মানুষ চিরকাল বিপন্ন। সাহিত্য চিরকাল মানুষের সেই বিপন্নতার সাক্ষ্য বহন করে চলেছে। আদিম কাল থেকে এই বিপন্নতার মধ্যেই মানুষ বেঁচে আছে। বেদে, পুরাণে, কাব্যে, মহাকাব্যে বিপন্ন মানুষজাতির কথাই বর্ণিত হয়েছে। আধুনিক যুগে এসে সাহিত্য যখন মানবজীবনমুখিতায় নিজের গতিপথ পরিবর্তন করতে সচেষ্ট হল, তখন থেকে সেখানে জীবনমুখী মানুষের বিপন্নতাগুলি আরও সুস্পষ্টরূপে প্রতিভাত হল। সভ্যতার অগ্রগতিতে বিচিত্র অভিজ্ঞতার মধ্যে মানবজীবন চিরকালই অনিশ্চয় তথা বিপন্ন। আধুনিক যুগের সাহিত্যে

তথা গল্পসাহিত্যে বারংবার মানুষের এই অনিশ্চিত জীবনের কথা উঠে এসেছে। সাম্প্রতিক সময়ের প্রথিতযশা গল্পকার তিলোত্তমা মজুমদার (১১ জানুয়ারি, ১৯৬৬ — বর্তমান)-এর গল্পসাহিত্যেও এর ব্যতিক্রম ঘটেনি। শতবর্ষ পেরিয়ে বাংলা ছোটগল্পের দুনিয়ায় তাঁর আবির্ভাব ঘটেছে। স্বাধীন ভারতে জন্মগ্রহণ করে নতুন অর্থনীতির যুগে শৈশব ও কৈশোর জীবন অতিবাহিত করতে গিয়ে তিনি যেমন মানুষের বিপন্নতার সাক্ষী থেকেছেন, তেমনি নিজেও বহুবার বিপন্নতার সম্মুখীন হয়েছেন। বিপন্নতার কবলগ্রস্ত এ-সকল মানুষেরাই তিলোত্তমা মজুমদারের ছোটগল্পে বিচিত্রতার সঙ্গে বিরাজমান। বাঁচার জন্য তারা আপ্রাণ লড়াই করে; কখনও সেই লড়াই হয় আত্মক্ষয়ী, কখনও আবার তা চিরন্তন। তবে তিলোত্তমা মজুমদারের ছোটগল্পে এর চেয়েও বড় হয়ে ওঠে মানবজীবনের বিচিত্র সংকট। সংগ্রাম নয়, বরং সংকটচিত্রই তাঁর ছোটগল্পের মূলধন হয়েছে। এক্ষেত্রে তিলোত্তমা মজুমদারের সাহিত্যজীবনের শুরুর দিকে লেখা পাঁচটি ছোটগল্প আমাদের আলোচনার কেন্দ্রে রয়েছে। গল্পগুলি হল —

১. 'নিঃস্ব মানুষ ও সাদা ঘোড়া' (রচনাকাল ঃ ১৯৯৮)
২. 'দিবানাথের আত্মহনন রহস্য' (রচনাকাল ঃ ১৯৯৮)
৩. 'ডোমনি' (রচনাকাল ঃ ১৯৯৮)
৪. 'মেরুদণ্ড' (রচনাকাল ঃ ১৯৯৯)
৫. 'চরণ গাঁ, আলতা নদী' (রচনাকাল ঃ ২০০০)

'নিঃস্ব মানুষ ও সাদা ঘোড়া'র চাষা, 'দিবানাথের আত্মহনন রহস্য'-এর দিবানাথ, এমনকী 'ডোমনি' গল্পের মগন ডোম প্রত্যেকেই তারা বিপন্ন এবং বিপন্নতার ঘেরাটোপে অবশেষে তারা নিজেরাই নিঃশেষিত। এরমধ্যে আবার ব্যতিক্রম লক্ষ করা যায়। সামাজিক বিপন্নতাকে তুলে ধরতে গিয়ে তিলোত্তমা মজুমদার শুধু সমাজের ধ্বংসাত্মক ছবিই আঁকেননি, এই বিপন্নতাকে ছাপিয়ে মানুষের বেঁচে থাকার চেষ্টা তথা সংগ্রামকেও তিনি তাঁর ছোটগল্পে ভাষা দিয়েছেন। এরমধ্যে উল্লেখযোগ্য 'মেরুদণ্ড' গল্পের পাগল এবং 'চরণ গাঁ, আলতা নদী' গল্পে উঠে আসা চরণগাঁয়ের মানুষজন। তিলোত্তমা মজুমদারের উল্লিখিত এই পাঁচটি ছোটগল্পের আধারে 'বিপন্ন মানবজাতির কথা' বিষয়টি আমাদের মূল আলোচনার বিষয়। উল্লিখিত বিষয়ের নিরিখে রচনাকালের ধারাবাহিকতা রক্ষা করে আলোচনার পরবর্তী অংশে আমরা তাঁর ছোটগল্পগুলি বিশ্লেষণ করতে পারি।

২.০১ 'নিঃস্ব মানুষ ও সাদা ঘোড়া' ঃ আত্মক্ষয়ী মানুষের বিপন্নতা

সময় যত এগিয়েছে মানুষ ক্রমে আধুনিক হয়েছে। জীবনের অগ্রগতিতে মানুষের মধ্যে নতুন নতুন চাহিদার জন্ম হয়। জীবনের সত্যতার চেয়ে তখন তার মধ্যে সেই চাহিদাই বেশি সত্যতা প্রাপ্ত হয়। চাহিদামুখ্য জীবনকে বেশি মূল্য দিতে গিয়ে মানুষ আত্মীয়-পরিজন শুধু নয়, সে নিজেকেও ক্ষয় করতে ফেলতে পারে। বিশ্বায়নের সময়ে দাঁড়িয়ে সমাজে এই বিপন্নতার অজস্র উদাহরণ তৈরি হয়েছে। তিলোত্তমা মজুমদারের সাহিত্যজীবনের শুরুতে লেখা তাঁর দ্বিতীয় ছোটগল্প 'নিঃস্ব মানুষ ও সাদা ঘোড়া' (একান্তর, ১৯৯৮)-র একজন চাষার মধ্যে গল্পকার যুগবৈশিষ্ট্যকে চিহ্নিত করেছেন। নিদ্রাকালীন স্বপ্নের মধ্যে আপাতসুখী চাষার অবচেতনে নিহিত থাকা রাজা-উজির হয়ে ওঠার সুপ্ত ইচ্ছের প্রকাশ ঘটেছে। কিন্তু লেখিকা কৌশলে চাষার স্বপ্নকে বাস্তবায়িত করে দেখাতে চেয়েছেন, কল্পনার জগৎ এবং বাস্তব পৃথিবীর মধ্যে এক ঘোরতর পার্থক্য বিদ্যমান। চাষার জীবন অভিজ্ঞতায় আমরা বুঝতে পারি, যুগ যুগ ধরে মানুষের বিপন্ন হওয়ায় বীজ তার মনের ভেতরে প্রোথিত রয়েছে।

কয়েক ছটাক জমি আর বউ, ছেলে নিয়ে চাষার সুখে সংসার অতিবাহিত হচ্ছিল। জমিতে ডালের দানা, সর্ষে, কপি, বেগুন ইত্যাদি ফসল উৎপাদন করে দিব্যি তার জীবন চলছিল। স্ত্রী-পুত্র নিয়ে সাধারণ জীবন-যাপনে সুখী হলেও চাষার মন এর চেয়েও অধিক পরিমাণ সুখের সন্ধান করে। ক্ষেত জুড়ে কলাই বোনার পর সবুজ নধর মাসকলাইয়ে খেত ভরে গেলে ভালোমানুষের মতো চাষার মনে খুব আনন্দ হয়। কিন্তু মানুষের মনে সুখ, আনন্দের সীমা-পরিসীমা নেই। যথারীতি আত্মকামী চাষার হৃদয়ের আকাঙ্খা বাস্তব জগৎ ছেড়ে স্বপ্নজগতের স্তরে পৌঁছে যায় এবং সেই জগতে দাঁড়ালে সে প্রত্যক্ষ করে, "তার প্রিয় কলাই ক্ষেতে চরে বেড়াচ্ছে স্বপ্নের সেই সাদা ঘোড়া, যার সঠিক শরীর, রেশম কেশর, অনুপম চোখ। এমন ঘোড়া চাষা স্বপ্নেও ইতিপূর্বে দেখেনি।"[৪] সূর্যের আলো ফোটায় চাষার স্বপ্ন মিলিয়ে গেলেও "এক অপার্থিব ঘোড়া আর আটপৌরে চেতনা অধিকার করে বসল।"[৫] এরপর পার্থিব চিন্তাভাবনা তার চেতনায় অকেজো হয়ে প্রাধান্য পায় অপার্থিব সেই ঘোড়া, যে-চাষার কলাই ক্ষেতে বিচরণ করতে করতে চাষাকে সুখে শিহরিত করে তোলে। এই সুখের নেশায় মোহিত হতে চেয়ে চাষা এই রাজকীয় ঘোড়াকে লালন পালন করতে ব্যস্ত হয়ে পড়ে। সহিস চাষাকে বলেছিল এই ঘোড়া পালতে একটা আস্ত কলাই খেত, একটি বাড়ি আর স্ত্রীপুত্রের প্রয়োজন হবে। সুখের নেশায় অন্ধ চাষা সর্বস্ব শেষ করে হলেও তার সুখের অস্তিত্ব স্বপ্নের সাদা ঘোড়াটিকে বাঁচিয়ে রাখে। প্রথমে স্ত্রীর ভাঁড়ারে ঢুকে সর্বস্ব শেষ করে চাষা নিজের ভূখণ্ড সুদী শেঠকে বিক্রি করে দেয়। তারপর ছেলেকে শহরে নিয়ে গিয়ে আর ফিরিয়ে আনে না। এমনকী শহরের শেষ প্রান্তে দুশো মোহরের বিনিময়ে স্ত্রীকেও বেচে দেয়। এরপরেও ঘোড়া ক্ষুধার্ত, তৃষ্ণার্ত হলে চাষা নিজের ভিটে বিক্রয় করে শেষপর্যন্ত নিজেই বাজারের প্রান্তে গিয়ে মুখ থুবড়ে পড়ে যায় এবং ক্রেতা চাষাকে ভাগাড়ে ফেলে দেওয়ার কথা ঘোষণা করে।

মানুষজাতি কখনওই নিজেকে নিয়ে সুখী নয়। আপাত দৃষ্টিতে মনে হয় স্বপ্নময় জগতের সেই সাদা ঘোড়ার জন্য চাষা নিঃস্ব হল; কিন্তু খুব সূক্ষ্মভাবে দেখলে বোঝা যায় নিঃস্বতা মানবজীবনের সবচেয়ে নিগূঢ় সত্য, এই সত্যতার মধ্য থেকেই চাষা নিদারুণ স্বপ্ন দেখছে। তার প্রিয় কলাই ক্ষেত, আত্মজ, স্ত্রীসঙ্গ এসবকিছুর ঊর্ধ্বে অপার্থিব কোনও সুখে সে সুখী হতে চেয়েছিল। আধুনিক ছোটগল্পকার তিলোত্তমা মজুমদার আলোচ্য গল্পে মানবজীবনের এক ঘোরতর বিপন্নতার সঙ্গে আমাদের পরিচয় করিয়েছেন; যেখানে আমরা দেখি সুখের সন্ধান করতে গিয়ে মানুষ নিজেকেই হারিয়ে ফেলছে। ছন্দময় জীবনশৈলীতে কৃত্রিমতার অনুপ্রবেশ মানবজীবনের ছন্দময়তাকে ব্যাহত করে। সাদা ঘোড়াকে নিয়ে চাষা যে —কাল্পনিক সুখের জীবন কাটাতে চেয়েছিল, সেই অভিজ্ঞতা তাকে চরম বাস্তবমুখী করেছিল; কিন্তু চাষার ক্রমাগত আত্মক্ষয় তাকে জীবনমুখী হওয়া থেকে ব্যাহত করেছে। বিশ্বায়নের যুগে লেখা তিলোত্তমা মজুমদারের এই গল্পটিকে বিপন্ন মানবজীবনের প্রতীকী গল্পই বলতে হয়, যেখানে প্রতিটি আপাতসুখী মানুষ সর্বস্ব শেষ করে সর্বস্বান্ত আত্মক্ষয়িত হয়েও চাষার মতো পড়শির কাছে নিজেকে গর্বিত প্রমাণ করতে চায়। এখানেই মানুষের বিপন্নতা চিরন্তন তথা শাশ্বত।

২.০২ 'দিবানাথের আত্মহনন রহস্য' ঃ এক প্রেমিক পুরুষের বিপন্নতা

এই পৃথিবীতে একমেবাদ্বিতীয়ম্ জীব মানুষ, যে - কিনা আত্মহত্যা করে। একটি আত্মহত্যার পেছনে মানুষের ঠিক কোন বিপন্নতা লুকিয়ে থাকে তা নিশ্চিতরূপে বলা কঠিন হয়ে দাঁড়ায়। অনুমানের ওপর নির্ভর করে সমাজের মানুষ আত্মহননকারীকে সহানুভূতি জানায়, আবার মূল্যবান জীবনকে তুচ্ছজ্ঞান করায় তাকে হেয় করে; কিংবা তার প্রতি সমবেদনা জানবার ভাষা সমাজের কাছে অবশিষ্ট থাকে না। বরং আত্মহনন রহস্যের পেছনে কারণ অনুসন্ধান করতে মানুষজন ব্যস্ত হয়ে পড়ে। আত্মহননকারীর বিপন্নতা অনুসন্ধান করতে গিয়ে কখনও সখনও মানুষ নিজেও বিপন্ন হয়ে যায়। তবে তিলোত্তমা মজুমদারের 'দিবানাথের আত্মহনন

রহস্য' (একতারা, ২০০২) ছোটগল্পটির মধ্যে দিবানাথের বিপন্নতাই বড় হয়ে উঠেছে। সুস্পষ্ট কোনও কারণ নিশ্চিত না করলেও লেখিকা দিবানাথের আত্মহত্যার আগের দিনগুলির যে — বর্ণনা দিয়েছেন তাতে এই আত্মহনন রহস্যের অন্তরালে নিহিত কারণ খুঁজে নিতে পাঠকের কোনও অসুবিধা হয় না।

গল্পপাঠে দেখি চাকুরিজীবী স্ত্রীকে নিয়ে দিবানাথ সুখেই দিন কাটাচ্ছিলেন। চার বছর আগে কামারহাটিতে ফ্ল্যাট কিনেছিলেন, তিন বছর আগে সেই ফ্ল্যাটটিকে রং করিয়েছেন। অতঃপর ভাড়া বাড়ি ছেড়ে দিবানাথের স্ত্রী এক বছরকাল যাবৎ সেখানে বসবাস করছিলেন। চাকুরিজীবী এই দম্পতির মধ্যে অবসরের ব্যবধান রয়েছে তিন বছর; অর্থাৎ স্ত্রীর চার বছর, অন্যদিকে দিবানাথের সাত বছর। এই ব্যবধানের মধ্যেও অনেকে দিবানাথের আত্মহত্যার কারণ অনুমান করেছে। কিন্তু প্রকৃত কারণ তা নয়।

নিজেকে হত্যা করার আগে প্রতি মাসে দিবানাথ কামারহাটির ফ্ল্যাটে আসা-যাওয়া করছিলেন; কারণ দশ বছর আগে তিনি কবিতা বিষয়ক একটি পত্রিকা প্রকাশ করতেন, যার বারোটি সংখ্যা বেরোনোর পর পত্রিকার প্রকাশ তিনি বন্ধ করে দিয়েছিলেন; আবার নতুন করে সেই পত্রিকা প্রকাশ করতে শুরু করেছিলেন। প্রতিষ্ঠিত কবিরা যাঁরা বারো বছর আগে তাঁর পত্রিকায় লিখেছিলেন, তাঁরা এতদিন বাদেও সাম্প্রতিক সংখ্যাগুলোয় পুনরায় লেখা দিতে দ্বিধা করেননি। তবে একটি কবিতা পত্রিকার ক্ষেত্রে কবি, কবিতা এবং সম্পাদকের পরেও শেষ কথা হিসেবে থাকে কাগজ, ছাপাখানা, বিজ্ঞাপন সেই সঙ্গে ছাপাখানার মালিক। দিবানাথের পত্রিকা প্রকাশের ক্ষেত্রে ছাপাখানার মালিক তথা প্রকাশক বসন্তকুমারের বড়রকমের অবদান এই যে, "বাজারের চলতি ব্যয়মূল্যেরও কমে দিবানাথের পত্রিকা ছেপে দেবার প্রতিশ্রুতি দেন এবং তা নির্বাহ করেন।"[৬] অপরদিকে দিবানাথও বসন্তকুমারকে তার পত্রিকায় তরুণ কবিদের আহ্বান করার অনুরোধ জানিয়ে নির্ভরশীলতার মাত্রা বৃদ্ধি করেন। এই তরুণ কবিদের মধ্যে মাত্র দুটি কবিতা নিয়ে দিবানাথের পত্রিকায় হাজির হন বিরহী মিত্র। অনেকক্ষেত্রে তরুণ কবিদের কবিতা শূন্যস্থান পূরণে ব্যবহৃত হলেও বিরহী মিত্রের কবিতা এবং কবিতার বিষয়বস্তু দিবানাথকে আকর্ষিত করেছিল। ফলে স্ত্রীকে পাশে রেখেও দিবানাথ এই বিরহীর কল্পনায় রাত জেগেছিলেন, এমনকী ঠিকানা হাতে পৌঁছে গিয়েছিলেন তার বাড়ি। ক্রমে বিরহী মিত্রের বাড়ি দিবানাথের আসা-যাওয়া ঘনতর হয়েছিল। এক্ষেত্রে দিবানাথ সম্বন্ধে গল্পকার বলেছেন, "প্রত্যেকটি টবিন রোড আসার দিন তাঁর বুকের ভেতর মাদল বাজত। তিনি আটকাতে পারতেন না।"[৭]

প্রৌঢ় দিবানাথের আত্মহত্যার অন্তরালে রয়েছে তাঁর সন্তানহীনতা, দুরারোগ্য অসুখ বাঁধার সম্ভাবনা, দাম্পত্যসম্পর্কে দূরত্ব, পত্রিকা প্রকাশে আর্থিক দৌর্বল্য ইত্যাদি নানারকম অনুমান কাজ করেছে মানুষের মনে। কিন্তু এর বাইরেও এই পৃথিবীর মধ্যেই থেকে যায় কিছু অজানা রহস্য, যা শুধুমাত্র আত্মহননকারী জানে। দিবানাথ যার প্রেমে পড়েছিলেন তিনি কবি বিরহী মিত্র। এর বাইরে গিয়ে ব্যক্তি বিরহীকে দিবানাথের জানা কিংবা চেনা হয়ে ওঠেনি। প্রকাশক বসন্তকুমারের ক্ষেত্রেও এই একই কথা প্রযোজ্য। প্রকাশক ও একজন কবির স্বার্থ মিলেমিশে আত্মহত্যার আড়াই দিন আগে দিবানাথ যে মোহবিধুর দৃশ্য প্রত্যক্ষ করেছিলেন, দিবানাথের কাছে তা ছিল এক দুঃস্বপ্ন কল্পনা। স্বার্থশূন্য এক প্রেমিক পুরুষ দিবানাথ আবিষ্কার করেছিলেন জংলা আঁচল সামলানো বিরহী মিত্রকে, সেই সঙ্গে সৌন্দর্যহীন রুজিরোজগারের কেন্দ্রস্থল যা নাড়িভুঁড়িসমেত মানব উদরের মতো দিবানাথের সামনে ধরা দিয়েছিল। এই বিপন্ন অভিজ্ঞতায় দিবানাথ "কোনও কথা না বলে, নীরব মহাকালের মতো একাগ্রচিত্ত এবং সম্পূর্ণ আত্মনিমগ্নতায়"[৮] ডুবে গিয়েছিলেন। নিজের ভেতরকার পৃথিবীর সঙ্গে বাস্তব পৃথিবীকে মেলাতে না পেরে লাভপুরের কবি, অধ্যাপক, সম্পাদক দিবানাথ কলকাতা মহানগর ঘুরে বেড়িয়েছিলেন এবং সর্বত্র তিনি দেখেছিলেন অসংখ্য ক্ষয়ে যাওয়া, হাড় বের করা, রং মাখা মুখের আদলে

বিরহী মিত্র, যাঁদের হাতে রং করা নখের কোণায় লেগে থাকে গৃহস্থ হলুদের গন্ধ এবং কবিতা লিখে চলা কালির সামান্য দাগ।

কবি এবং কবিতার বাইরে একটি বাস্তব পৃথিবী রয়েছে। কবি বিরহী মিত্রের কবিতার প্রতি দিবানাথের মুগ্ধতাবোধ প্রেমিক হিসেবে তাঁকে যেমন বিপন্ন করে তুলেছিল, তেমনি প্রকাশক বসন্তকুমারের অন্ধকার ছাপাখানার ঘরে স্বার্থান্বেষী বিরহী মিত্রকে দেখেও দিবানাথ বিপন্নবোধ করেছিলেন। এই বিপন্নতা আত্মহননকারী ব্যক্তির একান্তই নিজস্ব, যা কখনওই কোনও পোস্টমর্টেম রিপোর্টে ধরা পড়ে না। তিলোত্তমা মজুমদারের মতো ছোটগল্পকার — যাঁরা মানবচরিত্রের ময়নাতদন্ত করে রহস্যানুসন্ধানের ক্ষমতা রাখেন, তাঁদের পক্ষেই মানুষের এ-জাতীয় বিপন্নতার স্বরূপ উদ্ধার করা সম্ভব হয়। লেখিকা দেখিয়েছেন পৃথিবীর মধ্যে থেকেও, সমাজে বসবাস করেও মানুষের মধ্যে একটি অধরা জগৎ অবস্থান করে, যে-জগৎ রূঢ় বাস্তব থেকে পুরোপুরি বিপরীতধর্মী। তাই চরম বাস্তবতা থেকে মুখ ফিরিয়ে বিপন্ন মানুষ যখন আত্মমগ্ন হতে বাধ্য হয় তখন তার আত্মহনন ছাড়া আর কোনও উপায় থাকে না। প্রিয়জনের চারিত্রিক স্খলন দিবানাথের কল্পনার জগতে প্রবল আঘাত হেনেছিল, যার ফল তাঁর আত্মহনন। মৃত্যুর দিন বিকেলে দোকানে গিয়ে দিবানাথ সংসারের নিত্য প্রয়োজনীয় সামগ্রী চিনি, পোস্ত, ধূপকাঠি কিনেছিলেন; কিন্তু জীবনের ঘোরতর বিপন্নতায় স্বার্থপর পৃথিবীর দিকে তিনি আর ঘুরে দাঁড়াবার ইচ্ছেটুকু অবশিষ্ট রাখতে পারেননি। তাঁর এই অপারগতাও আমাদের ভিন্ন এক বিপন্নতার সন্ধান দেয়।

২.০৩ 'ডোমনি' ঃ প্রবৃত্তি-তাড়িত বিপন্নতার স্বরূপ

তিলোত্তমা মজুমদারের 'ডোমনি' (শারদীয় উৎসব, ২০০০) ছোটগল্পটিতে পুরুষতান্ত্রিক সমাজব্যবস্থায় শোষিত নারীর প্রতিবাদের কথা বর্ণিত হয়েছে। এই প্রতিবাদের প্রচ্ছন্নে রয়েছে প্রবৃত্তি-তাড়িত এক বিপন্ন পুরুষের মূল্যবোধ, মানবিকতা এবং মনুষ্যত্ব হারিয়ে ফেলার কাহিনি। গল্পের শুরু থেকে আমরা দেখি মগন ডোমের কাছে চিতা জ্বালানো প্রাকৃতিক চাহিদার মতো একটি স্বাভাবিক ব্যাপার এবং তা তার কাছে নেশার মতো, নিত্য প্রয়োজনীয়। অর্থাৎ শব পোড়ানোই মগন ডোমের একমাত্র বৃত্তি তথা পেশা, যা ক্রমে তার নেশায় পরিণত হয়েছে। সাধারণ জীবনচর্যারত স্ত্রী হিরানি ডোমনি ডোমের ভেতরে বাড়তে থাকা এই তাড়নার কারণ বুঝতে পারে না। সে দেখে ডোম অক্লান্ত পরিশ্রম করে, বর্ষা আসার আগে কাঠ সংগ্রহে মন দেয়। "সূর্যাস্তের পরও কোনও শব না পেলে খুবই অস্থির হয় ডোম এবং এক অলীক সময় যাপন করে।"[৯] — ডোমনি বুঝতে পারে তার চোখের সামনে মগন ডোমের মৃত্যুর আবাহন বেড়ে চলেছে।

শ্মশানের চারপাশে একদিন মহামারী আসে; যে-দশগাঁ জোড়া মানুষ ছিল, তাদের জীবন ঘোরতর বিপর্যয়ের সম্মুখীন হয়। শবের পর শব এসে ভরে যায় শ্মশান; আকাশে শকুন উড়ে বেড়ায় আর বাতাসে মড়া পোড়ানোর গন্ধ ছেয়ে যায়। নাওয়া নেই, খাওয়া নেই, উল্লাসে এবং আকুল উন্মাদনায় মগন ডোম মড়া ঘাঁটে আর পোড়ায়। এভাবেই সময় বয়ে যায়, প্রবল অস্থিরতা গ্রাস করতে থাকে ডোমকে; কারণ গাঁয়ের পৰ গাঁ উজাড় হতে হতে গাঁয়ে আর শব বহনের লোক অবশিষ্ট থাকে না। তবুও ডোম নেশায় মগ্ন থাকে, কাঠ জড়ো করে, চিতা সাজায়। একসময় সে শান্ত হয়, পূর্ণবয়স্ক মানুষের চিতা সাজিয়ে তাতে আগুন দেয় এবং সন্ধে ঘনালে অন্ধকার এগিয়ে এলে সেও এগিয়ে যায় নিজের গৃহের দিকে। আমরা পাঠকমাত্র বুঝতে পারি যে, ডোমের বৃত্তি ক্রমে তার প্রবৃত্তিতে পরিণত হয়েছে। অতএব সেই তাড়নায় "কোনও মৃতদেহ ছাড়াই সে আগুন দিল চিতায়। তারপর গৃহের দিকে গেল। অন্ধকার মেটে ঘরে গুটিয়ে পড়ে ছিল হিরানি ডোমনি। ক্লান্ত। ক্লিষ্ট। ক্ষুধাতুৰ। একা। ডোম তাকে সবলে তুলে ফেলল কাঁধের ওপর। রওনা দিল চিতার দিকে।"[১০] নিজের পেশার

জগতে মানুষ কীভাবে বিপন্ন হয়ে পড়ে, তিলোত্তমা মজুমদারের ছোটগল্পে সেদিকটাও বিষয় হয়ে উঠে এসেছে। এরপর আর এটি ডোমের গল্প থাকে না, হয়ে ওঠে প্রতিবাদী এক ডোমনির গল্প। প্রতিবাদে, আত্মশক্তিতে ডোমনি কামড় বসায় মগন ডোমের পিঠে এবং এক ধাক্কায় সে ডোমকে চিতার ওপর ঠেলে ফেলে দেয়। প্রবৃত্তির তাড়নায় সকাল থেকে এই চিতা মগন ডোম নিজের হাতেই সাজিয়েছিল; এমনকী নিজেই তাতে আগুন দিয়ে সমস্ত ব্যবস্থা করে রেখেছিল। মূল্যবোধহীনতায় মানবিকতা ভুলে ডোম নিজের স্ত্রীকে তার প্রবৃত্তির শিকার করতে চেয়েছিল। কিন্তু শেষপর্যন্ত ডোমের হাতে বাধা দেওয়ার সুযোগটুকুও আর অবশিষ্ট থাকে না। গল্পকার তিলোত্তমা মজুমদারের তাঁর সহজ সরল ভাষাশৈলীর গুণে প্রবৃত্তি-তাড়িত বিপন্নতার মধ্যে পড়ে ডোমের ফুরিয়ে যাওয়ার অন্তিম দৃশ্যটি অত্যন্ত ব্যঞ্জনাবহ করে তোলেন এভাবে, "চিতার আগুন সাপটে নিল তাকে। চিতাকাঠ জড়িয়ে থাকল বুক, পেট, মস্তক আর পাগুলি।"[১১]

গল্পপাঠান্তে আমাদের মনে হয়, গতিশীল সময়ের মধ্যে পড়ে মানুষ ক্রমান্বয়ে আত্মমূল্য হারিয়ে ফেলছে। তারা ভুলে যাচ্ছে পেশাগত পরিচিতির ঊর্ধ্বে গিয়ে সে একজন মানুষ। পৃথিবীর সঙ্গে তার কেবল বৃত্তিগত সম্পর্ক নয়; এর বাইরে একজন সাধারণ মানুষ হিসেবে তার নিজের প্রতি যেমন দায়িত্ব রয়েছে, তেমনি দাম্পত্য সম্পর্ক স্থাপন করার পর স্ত্রীকেও সমমর্যাদা দিতে সে দায়বদ্ধ। কিন্তু ডোমের ক্ষেত্রে আমরা দেখি সে আদ্যোপান্ত আত্মমগ্ন, প্রবৃত্তির তাড়নায় মোড়া একজন পুরুষ। বৃত্তির নেশায় এতটাই অন্ধ হয়ে ছিল যে মগন ডোম বুঝতে পারেনি যে — আগুনে সে আকুল উন্মাদনায় শবদেহ পুড়িয়ে উল্লসিত হচ্ছে, সেই আগুনই একদিন প্রবৃত্তির আগুনে পরিণত হবে এবং শবদেহের মতো তাকেই গ্রাস করে নেবে। জীবনের চলমানতায় নতুন সময়ে এসে মনুষ্যজাতি ক্রমে এই বিপন্নতার সম্মুখীন হচ্ছে। তিলোত্তমা মজুমদারের আলোচ্য ছোটগল্পটি এক্ষেত্রে তাই ভীষণভাবে প্রাসঙ্গিক।

২.০৪ 'মেরুদণ্ড' ঃ সামাজিক বিপন্নতা ও একজন পাগলের আত্মসংকট

তিলোত্তমা মজুমদারের গল্পসাহিত্যে 'মেরুদণ্ড' (শারদীয় উৎসব, ২০০১) ছোটগল্পটি শ্রেষ্ঠত্বের দাবি রাখে। এখানে অমেরুদণ্ডী সমাজের একটি বীভৎস ছবি ফুটে উঠেছে। রেলব্রিজের নিচে একটি স্টেশনচত্বরের সমাজব্যবস্থাকে কেন্দ্র করে গল্পটির প্লট গড়ে উঠেছে। দুজন ম্যাগাজিন হকার, দুটি ফলওয়ালা আর একটি সেলুন নিয়ে গঠিত এই সমাজের চিত্রটি গল্পের শুরুতেই লেখিকা তুলে ধরেছেন এভাবে, "নোংরা শ্যাওলাধরা দেওয়ালে নানারকম পোস্টার। গর্ভপাত কেন্দ্রের হদিস, গোপনে যৌনরোগ সরিয়ে দেবার আশ্বাস, জনপ্রিয় অভিনেতা ও অভিনেত্রীর ছবিসমেত সিনেমার পোস্টার, রাজনৈতিক বয়ান লেখা পোস্টারও বাদ নেই।"[১২] লোকসমাগমে সদা ব্যস্ত, সচল, পরিবর্তনশীল এই সমাজকেই নিজের আস্তানা হিসেবে বেছে নিয়েছে একজন পাগল। পথচলতি ব্যস্ততার মধ্যে কেউ আকাশ দেখে না; কিন্তু পাগল ব্যতিক্রমী, এখানে আসার পর সে সবচেয়ে বেশি আকাশকেই নিরীক্ষণ করেছে। আপাতদৃষ্টিতে সে কারও অসুবিধে না ঘটালেও, অল্পকিছুদিনের মধ্যে পাগল লোকটি কয়েকজন যাত্রীর বিরক্তির কারণ হয়ে ওঠে। এর কারণ হল, পাগলটি নিজে থাকার জন্য যে — স্থান নির্বাচন করেছে তা ওই যাত্রীরা প্রস্রাবের জন্য ব্যবহার করে। তাই ম্যাগাজিনওয়ালা পাগলের এই থেকে যাওয়াকে স্নেহের চোখে সমর্থন করলেও সে ক্রমে যাত্রীপক্ষের স্বার্থহানির কারণ হয়ে ওঠে। এই কারণের ওপর ভিত্তি করেই পথচলতি অনেকেই মুখে বিরক্তি মেখে হাতের ছাতা দিয়ে পাগলকে খোঁচায়, বিরক্ত করে আনন্দ পায়। এই খোঁচাখুঁচির মধ্যে নিহিত অপমান পাগলকে বিদ্ধ করে কিনা সেই সম্পর্কে কোনও মানবিক ধারণা লোকগুলির নেই; তবে গল্পকার পর্যবেক্ষণ করেন, পাগল তার ঠোঁটে চেপে রাখা একটি কাঠি এদিক থেকে ওদিক করে নেয়।

একদিন একজন যাত্রী পাগলের এই ধৈর্যশীলতায় অধৈর্য হয়ে রাগে প্যান্টের চেন খুলে এমন এক জায়গায় মূত্রত্যাগ করল যাতে মানুষটির গায়ে নোংরা ছিটে যায়। তিলোত্তমা মজুমদার দেখিয়েছেন, মূল্যবোধহীনতা মানুষকে পাগল করে আর পাগলের মধ্যেকার মনুষ্যত্ব তাকে মানবিক স্তরে উন্নীত করে। বিস্ফারিত, রক্তাভ চোখে সে শায়িত অবস্থা থেকে উঠে দাঁড়ায়, থুথু ছেটায় এবং খুঁজতে থাকে কিছু। শুধু তা-ই নয়, ব্যস্ত রাস্তায় সমস্ত প্রতিকূলতা ভেদ করে একখানি শুকনো ঋজু কঞ্চি পরম যত্নে তুলে নেয়, শান্ত আত্মমগ্ন ভঙ্গিতে কঞ্চিটি পরিষ্কার করে শিরদাঁড়া বরাবর প্যান্টের খাঁজে গুঁজে দেয়। এরপর ধীর পায়ে টানটান গতিতে সে চলতে থাকে পুরোনো জায়গার দিকে। কিন্তু এই বিপন্ন সমাজ কি পাগল মানুষটিকে তার পুরোনো জায়গা ছেড়ে দেবে, এমনই এক প্রচ্ছন্ন আত্মজিজ্ঞাসায় তিলোত্তমা মজুমদার গল্পটি শেষ করেন।

কোনওরকম বিবাদে না জড়িয়ে, কারও কোনও ক্ষতি না করে পাগলটি নিজের সুরক্ষার ব্যবস্থা নিজেই করে নেয়। স্বার্থপর সমাজকে সে ক্রিয়াকলাপের মধ্য দিয়ে বুঝিয়ে দেয় পাগল হলেও সে একজন মানুষ। ব্যস্ত সচল রাস্তায় যাতায়াত করা যাত্রী, যারা নিজেদের মানুষ বলে দাবি করে, প্রস্রাব করার জায়গা দখল করেছে বলে পাগল ব্যক্তির গায়ে মূত্র ছেটায়, তাদের মেরুদণ্ডের অস্তিত্ব সম্পর্কে তিলোত্তমা মজুমদারের এই গল্প পাঠকের মনে প্রশ্ন তোলে। পাগলের 'পাগল' হওয়ায় যেমন কোনও বাধা নেই, তেমনি মানুষের সমাজে তার স্বাধীনভাবে বেঁচে থাকারও অধিকার আছে। কিন্তু বিচার-বিবেচনার শক্তি মস্তিষ্কে ধারণ করেও যাত্রীটি মূল্যবোধ হারিয়ে পাগলের প্রতি অসহ্য হয়ে ওঠে শুধুমাত্র এই কারণে যে, সে তার মূত্রত্যাগের স্থান দখল করেছে। একটি শুকনো কঞ্চি নিজের হাতে পরিষ্কার করে শিরদাঁড়া বরাবর গোঁজার দৃশ্যের মধ্য দিয়ে তিলোত্তমা মজুমদারের পাগল চরিত্রটি আমাদের সাধারণ স্বার্থকামী সমাজের বিপন্নতার প্রতি চিরন্তন প্রশ্ন উত্থাপন করে।

২.০৫ 'চরণ গাঁ, আলতা নদী' ঃ বিপন্ন মানুষজাতির কথা

সুপ্রাচীন কাল থেকেই খাদ্যসংকট মানুষের জীবন-পরিক্রমার সঙ্গে জড়িয়ে রয়েছে। আধুনিক সমাজব্যবস্থায় এসেও এই সংকট থেকে মানুষজাতির মুক্তি ঘটেনি। তিলোত্তমা মজুমদারের 'চরণ গাঁ, আলতা নদী' (শারদীয় দক্ষিণীবার্তা, ২০০০) ছোটগল্পটি মানুষজাতির সেই চিরকালীন বিপন্নতার দিকে ইঙ্গিত করে। ডুংলা পাহাড়ের কাছে একটি গ্রাম চরণ গাঁ-কে কেন্দ্র করে তিনি গল্পটি রচনা করেছেন। যে — গায়ের মানুষজন সূয্যিঠাকুর আর রাত্রিঠাকরুণের আশীর্বাদের বিশ্বাস নিয়ে বেঁচে থাকে। এছাড়াও তাদের গাঁয়ে মেঘদেবতার পূজা হয়। সে-পূজা ক্ষেতের ওপর, বড় কঠিনরকমের সেই পূজা। মেঘদেবতাকে সহজে তুষ্ট করা যায় না। কোনও এক বছরে এলে পর পর আর কয়েকবছর তাঁর পাত্তা পাওয়া যায় না। তাই নারী-পুরুষ নির্বিশেষে বৃষ্টির প্রত্যাশা আর সবুজ চারাগাছের স্বপ্ন নিয়ে চরণগাঁয়ের মানুষজন বেঁচে থাকে।

চরণগাঁয়ে জলের উৎস নেই। অনাবৃষ্টির ফলে সেখানে খরা দেখা দেয়, মারুয়া ডাঁটা শুকিয়ে হলদে হয়ে যায়, জোয়ারের ক্ষেত শুনশান, বীজ শুকিয়ে মাটির তলায় পড়ে থাকে। তাদের এই দুরাশার আশা, দুর্দিনের বন্ধু বলতে দু'মাইল দূরে প্রবাহিত আলতা নদী। চরণগাঁয়ের কেউ কখনও এই প্রবাহ শুকিয়ে যেতে দেখেনি। রাত থাকতে লোক উঠে এসে এই নদী থেকেই জল সংগ্রহ করে পরিবারের জন্য নিয়ে যায়। একবার এমন এক অনাবৃষ্টির দিনে রুনির বাবা মারা গেছে, বাবার শোকে তার মা-ও নিজেকে শেষ করেছে। সেই থেকে বুড়ো হারে নিজের জমিতে কোদাল চালিয়ে রুনিকে আগলে রেখেছে তার নানী। কিন্তু নানীর শরীর এখন ঝুলে পড়েছে, তাই তেরোয় পা দেওয়া রুনি আলতা নদীতে যায়, জল সংগ্রহ করে আনে।

জল তুলতে গিয়ে একদিন রুনির হাত ধরে সুন্দর এক মানুষ, "গৌরবরণ মানুষটির চওড়া বুকে হলুদ ফুলের মালা। মাথার চুলে চুড়ো। কোমরে সাদা বসন মালকোচা করা।"[১৩] দুঃখী মেয়ে রুনির সঙ্গে চরণগাঁয়ে আসেন সেই সুন্দর পুরুষ। রুনির কাছে তিনি জানতে পেরেছেন চরণগাঁয়ে বৃষ্টির বড় অভাব, তাই গাঁয়ে অতিথি হিসেবে এসে তিনি বৃষ্টি দেওয়ায় প্রতিশ্রুতিবদ্ধ হন। 'আমি মেঘদেবতার দূত'[১৪] — এই বলে তিনি গাঁয়ের সাধারণ মানুষের বিশ্বাস অর্জন করেন। বৃষ্টির অভাবে গাঁয়ের লোক তাঁর চরণে আভূমি প্রণত হয়ে বৃষ্টির আকুলতা ও আবেদন প্রকাশ করে। এখানে গল্পটি অন্যদিকে মোড় নেয়। যে — বিশ্বাস নিয়ে চরণগাঁয়ের সাধারণ মানুষ এতকাল জীবন যাপন করছিল, সুন্দর পুরুষ এসে তাদের সেই বিশ্বাসে যুক্তির বীজ প্রোথিত করলেন। খরায় পাথর হয়ে যাওয়া জমিতে তিনি কোদালের ঘা মারলেন। সেই সঙ্গে গাঁয়ের সকল মানুষ তাঁর অনুগামী হল, সকাল থেকে সন্ধে পর্যন্ত মন দিয়ে মাটি কাটল। মেঘদেবতার দূত হয়ে মেঘদেবতার পূজা বলতে গাঁয়ের লোককে তিনি একথাই বোঝাতে চাইলেন যে, সংকটই শেষ কথা নয়, সংকটের সমাধান কাজের মধ্যেই নিহিত থাকে।

মেঘদেবতার দূত সুন্দর পুরুষটি গাঁয়ের মানুষজনকে বলেছিলেন, বৃষ্টি আসবে। মাটি কাটতে কাটতে গাঁয়ের মানুষ আটদিনান্তে আলতা নদীর কাছে উপনীত হল। অবিশ্রাম শ্রমে তাদের নয়দিন অর্থাৎ যজ্ঞের শেষদিন পেরিয়ে গেল; কিন্তু আকাশে মেঘ দেখা দিল না, বৃষ্টিও এল না। তবে সকালে তারা দেখল খুঁড়ে রাখা জায়গা থেকে নদী পর্যন্ত সাজিয়ে রাখা সার সার কোদাল। একসময় আলতা নদী থেকে জল এসে পৌঁছে গেল খুঁড়ে রাখা জায়গায়। পুরুষেরা আকাশের দিকে তাকিয়ে দেখল বৃষ্টি নেই, অথচ জল এসে আছড়ে পড়েছ। মানুষরূপী দূত এসে চরণগাঁয়ের মানুষকে কর্মযজ্ঞে সামিল করেছেন, অতএব কর্মের দ্বারা তারা জীবনের বিপন্নতাকে কাটিয়ে উঠতে সক্ষম হয়েছে। এই প্রসঙ্গে আমাদের শ্রীরামচন্দ্রের দেবীর অকাল বোধন এবং রাবণ-বধের পৌরাণিক কাহিনিটি মনে পড়ে যায়। আপাতদৃষ্টিতে রূপকথার গল্পের মতো মনে হলেও তিলোত্তমা মজুমদার এই গল্পের মধ্য দিয়ে দেখাতে চেয়েছেন, কর্মের জোরে চরণগাঁয়ের মানুষের জীবনের সংকট মোচন করেছে তথা তাদের বিপন্মুক্তি ঘটেছে। যুক্তিবাদের যুগে বসে লেখা এই ছোটগল্পটি আমাদের কর্মের প্রতি দীক্ষিত ও মনযোগী হতে শেখায়। জীবনের ঘোরতর বিপন্নতায় তথা সংকটে বিজ্ঞানের প্রতি নির্ভরতা মানুষকে রক্ষা করে। এরজন্য অবশ্যই আমাদের শিক্ষার প্রয়োজন। আলোচ্য গল্পে চরণগাঁয়ের মানুষজনকে হলুদ মালাধারী সুন্দর পুরুষটি সেই শিক্ষাই প্রদান করেছেন।

৩.০০ উপসংহার ঃ

আলোচনার অন্তিমে এসে বলতে পারি যে, তিলোত্তমা মজুমদারের ছোটগল্পে মানুষই সর্বপ্রধান উপাদান; — গল্পগুলির বিশ্লেষণে তা প্রমাণিত। মানুষের জীবনের ওপর লক্ষ করে তাঁর এই ছোটগল্পগুলি সৃষ্টি হয়েছে। সুপ্রাচীন কালে মানবজীবনে যে — সমস্যাগুলি বহমান ছিল, আধুনিক সমাজে এসেও যে তা নির্মূল হয়নি, ছোটগল্পগুলির আলোচনায় তা স্পষ্ট করা গেল। তিলোত্তমা মজুমদারের 'নিঃস্ব মানুষ ও সাদা ঘোড়া' গল্পে সাদা ঘোড়া দেখে চাষার প্রলুব্ধ হওয়া, 'দিবানাথের আত্মহনন রহস্য' গল্পে প্রকাশককে শরীরী প্রলোভন দেখিয়ে বিরহী মিত্রের কার্যোদ্ধারের অপচেষ্টা, 'ডোমনি' গল্পে ডোমের প্রবৃত্তির তাড়না, 'মেরুদণ্ড' গল্পে মনুষ্যজ্ঞান না করে একজন পাগলকে তুচ্ছ-তাচ্ছিল্য করা, 'চরণ গাঁ, আলতা নদী' গল্পে ক্ষুধা নিবৃত্তির জন্য মেঘদেবতার কাছে মানুষের আকুল আবেদন প্রকাশ — এসব কিছু আবহমানকাল ধরে চলে আসা মানুষজাতির চিরন্তন বিপন্নতার দিকেই ইঙ্গিত করে।

সমাজে বারবার পরিবর্তন এসেছে, কিন্তু মানুষ তার জীবনের অনিশ্চয় অবস্থা তথা বিপন্নতার হাত থেকে রক্ষা পায়নি। তিলোত্তমা মজুমদারের ছোটগল্প বিশ্লেষণে আমরা দেখি বেশিরভাগ ক্ষেত্রে সেই বিপন্নতা মানুষকে গ্রাস করেছে, আবার কোনও কোনও ক্ষেত্রে সংগ্রামী মানুষ সংঘবদ্ধ জীবনের ঘোরতর বিপন্নতার মধ্যেও তার বাঁচার পথ খুঁজে নিয়েছে। 'ডোমনি' গল্পে ডোমনি, 'মেরুদণ্ড' গল্পে পাগল, 'চরণ গাঁ, আলতা নদী' গল্পে চরণগাঁয়ের মানুষ তারা সংকটের মধ্যেও সমাধান রচনার চেষ্টা করেছে। অতএব জীবনে চলার পথে সংকট থাকবে, কিন্তু মূল্যবোধ হারিয়ে ফেলে নিজেকে বিপন্ন করে ফেলার মধ্যে মনুষ্যত্বের যে — অপমান নিহিত রয়েছে, মানুষজাতিকে সে-কথা বুঝতে হবে। সাদা ঘোড়ার প্রতি প্রলুব্ধ হয়ে চাষা শুধু তার স্ত্রী-সন্তানকে নয়, এমনকী নিজেকেও মূল্য দেয়নি; বিরহী মিত্রের ঘটনায় দিবানাথের আত্মমগ্নতা তাকে আত্মহননের পথে ঠেলে দিয়েছে; মগন ডোম প্রবৃত্তির তাড়নার মধ্যে পড়ে আত্মবিস্মৃত হয়েছে এবং বেখেয়ালে স্বহস্তে নিজের চিতা সাজিয়েছে। তিলোত্তমা মজুমদারের ছোটগল্প-পাঠ মনুষ্যচরিত্রের গভীরে রয়ে যাওয়া এই আদিমতাগুলি নিয়ে পাঠককে ভাবতে বাধ্য করে। এখানেই আলোচ্য ছোটগল্পগুলির সার্থকতা।

৩.০১ সিদ্ধান্ত তথা গবেষণার ফলাফল ঃ

ওপরের আলোচনার নিরিখে আমরা এই সিদ্ধান্তে উপনীত হতে পারি যে,

- তিলোত্তমা মজুমদারের ছোটগল্প মানবজীবন নির্ভর।
- সমাজের যে-কোনও স্তরের মানুষই তাঁর ছোটগল্পের চরিত্র হয়ে ওঠে।
- ওপরের আলোচনায় যাদের জীবন বিপন্নতার সম্মুখীন হয়েছে তারা কেউ চাষা, কেউ কবি, কেউ আবার ডোম, কেউ পাগল।
- তাঁর ছোটগল্পে জীবনের সংকট চিত্র যেমন আছে, তেমনি আবার সংকট থেকে উত্তরণ তথা বিপন্মুক্তির ছবিও ধরা পড়েছে।
- তিলোত্তমা মজুমদারের ছোটগল্পে নারীর অবস্থানের কথা আছে ঠিকই, তবে পরুষ অবস্থানও সমানভাবে গুরুত্ব পেয়েছে।
- মানুষের আত্মসংকট তিলোত্তমা মজুমদারের ছোটগল্পে বিশেষভাবে প্রাধান্য লাভ করেছে।
- তাঁর ছোটগল্প-পাঠ আমাদের বুঝতে সাহায্য করে যে, মূল্যবোধ হারানো মানুষজাতি কীভাবে সভ্য সমাজে সামাজিক বিপন্নতা সৃষ্টি করেছে এবং অন্যের জীবন বিপন্ন করে তুলেছে।
- তিলোত্তমা মজুমদারের ছোটগল্প মনুষ্যচরিত্রের অতল অন্ধকারে রয়ে যাওয়া আদিমতাগুলি নিয়ে ভাবতে সাহাজ্য করে।
- লোভী, প্রতারক, প্রবৃত্তি তাড়িত মানুষের সংকটকে তুলে এনে তিলোত্তমা মজুমদার তাঁর ছোটগল্পে সামাজিক অবক্ষয়ের প্রতিফলন ঘটিয়েছেন।
- ছোটগল্পের মাধ্যমে আপাত সভ্য সমাজের প্রতি তিলোত্তমা মজুমদারের সোচ্চার বিদ্রোহ ঘোষিত হয়েছে।
- কাহিনি প্রধান হলেও তিলোত্তমা মজুমদারের ছোটগল্পে চরিত্র যে অপ্রধান, তা বলা যায় না।
- সর্বপ্রধান সিদ্ধান্ত এই যে, তিলোত্তমা মজুমদারের ছোটগল্প আধুনিক যুগ-সংকটের যথার্থ পরিচয় বহন করে।

❖❖❖

সূত্র নির্দেশ ঃ

১. ভট্টাচার্য, সুকুমারী, ঋগ্বেদের দিনের মানুষ, প্রাচীন ভারত ঃ সমাজ ও সাহিত্য, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ আষাড় ১৩৯৪, তৃতীয় মুদ্রণ বৈশাখ ১৪০১, পৃষ্ঠা. ২০
২. তদেব, পৃষ্ঠা. ২১
৩. তদেব, পৃষ্ঠা. ২১
৪. মজুমদার, তিলোত্তমা, নিঃস্ব মানুষ ও সাদা ঘোড়া, ঋ, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ ডিসেম্বর ২০০৩, সপ্তম মুদ্রণ জুলাই ২০১৮, পৃষ্ঠা. ৬৫
৫. তদেব, পৃষ্ঠা. ৬৫
৬. মজুমদার, তিলোত্তমা, দিবানাথের আত্মহনন রহস্য, ঋ, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ ডিসেম্বর ২০০৩, সপ্তম মুদ্রণ জুলাই ২০১৮, পৃষ্ঠা. ৭৫
৭. তদেব, পৃষ্ঠা. ৭৭
৮. তদেব, পৃষ্ঠা. ৭৯
৯. মজুমদার, তিলোত্তমা, ডোমনি, ঋ, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ ডিসেম্বর ২০০৩, সপ্তম মুদ্রণ জুলাই ২০১৮, পৃষ্ঠা. ৮৩
১০. তদেব, পৃষ্ঠা. ৮৪
১১. তদেব, পৃষ্ঠা. ৮৫
১২. মজুমদার, তিলোত্তমা, মেরুদণ্ড, ঋ, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ ডিসেম্বর ২০০৩, সপ্তম মুদ্রণ জুলাই ২০১৮, পৃষ্ঠা. ৯০
১৩. মজুমদার, তিলোত্তমা, চরণ গাঁ, আলতা নদী, ঋ, আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯, প্রথম সংস্করণ ডিসেম্বর ২০০৩, সপ্তম মুদ্রণ জুলাই ২০১৮, পৃষ্ঠা. ৯৭
১৪. তদেব, পৃষ্ঠা. ৯৮

গ্রন্থপঞ্জি ঃ

আকর গ্রন্থ ঃ

১. মজুমদার, তিলোত্তমা; ঋ; আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯; প্রথম সংস্করণ ডিসেম্বর ২০০৩; সপ্তম মুদ্রণ জুলাই ২০১৮

সহায়ক গ্রন্থ ঃ

১. ভট্টাচার্য, সুকুমারী; প্রাচীন ভারত ঃ সমাজ ও সাহিত্য; আনন্দ পাবলিশার্স প্রাইভেট লিমিটেড, কলকাতা ৭০০০০৯; প্রথম সংস্করণ আষাঢ় ১৩৯৪; তৃতীয় মুদ্রণ বৈশাখ ১৪০১

অসমীয়া লোকসাহিত্যৰ অন্যতম অংগ ‘ডাকৰ বচন’ - এটি চমু সমীক্ষা

ড° মুনমী কোঁৱৰ
সহকাৰী অধ্যাপিকা, অসমীয়া বিভাগ
দুলীয়াজান মহাবিদ্যালয়

সংক্ষিপ্তসাৰ ঃ

অসমীয়া লোকসাহিত্যৰ এটি অন্যতম সম্পদ হৈছে ডাকৰ বচনসমূহ। এই ডাকৰ বচনসমূহ প্রবাদ বাক্য ৰূপে যুগে যুগে অসমীয়া জন-সমাজত প্রচলিত হৈ আহিছে। এই বচনবোৰৰ উৎপত্তিৰ পটভূমি হ'ল কৃষিকেন্দ্রিক গ্রাম্য সমাজ। কৃষিকেন্দ্রিক সমাজৰ প্রয়োজনত ইয়াৰ জন্ম হৈছিল। শ শ বছৰ ধৰি জাতিয়ে লাভ কৰা ব্যৱহাৰিক অভিজ্ঞতা, ৰুচি-অভিৰুচি, শুভা-শোভৰ ধাৰণা, বিশ্বাসৰ আধাৰ ভূমিত এই বচনসমূহ। ধর্ম প্রকৰণ, নীতি প্রকৰণ, ৰাজনীতি প্রকৰণ, ৰন্ধন প্রকৰণ, গৃহিণী লক্ষণ, পৰিত্যাগ কথন, স্বাস্থ্যৰ প্রকৰণ, বৃষলক্ষণ, কৃষি লক্ষণ, বর্ষা লক্ষণ, জ্যোতিষ প্রকৰণ, খেতি বর্ণনা আদি সমাজৰ সকলো লাগতিয়াল বিষয়েই ডাকৰ বচনত পোৱা যায়। সমাজৰ পৰিৱর্তনৰ লগে লগে কিছুমান বচন লুপ্ত পাইছে যদিও আজিও অসমীয়া সমাজত ইয়াত গুৰুত্ব অপৰিসীম। আমাৰ আলোচনাত গৃহ নির্মাণ, কৃষি আৰু ৰন্ধন প্রকৰণ সম্পর্কে ডাকে কিদৰে উল্লেখ কৰি গৈছে এই সম্পর্কে আলোচনা কৰা হ'ব।

বীজ শব্দ ঃ অসমীয়া লোকসাহিত্য, জনসমাজ, ডাক, ডাকৰ বচন।

০.০ প্রস্তাৱনা ঃ

অসমীয়া লোক-সাহিত্যৰ ভিতৰত এটা প্রধান ভাগ হৈছে ফকৰা-যোজনা আৰু প্রৱচনসমূহ। এই সমূহত সাংসাৰিক অভিজ্ঞতালব্ধ, জ্ঞানমূলক নীতি, বিভিন্ন সময়ত প্রচলিত জীৱনচর্য, আদর্শবাদ, জাতিৰ মনস্তত্ব, আচাৰ-ব্যৱহাৰ আৰু বহু ক্ষেত্রত সমালোচনাও পোৱা যায়। এই প্রবাদবোৰৰ অর্ন্তগত ডাকৰ বচনবোৰ যোগে যোগে অসমীয়া জনসমাজত প্রচলিত হৈ আহিছে। ডাক - খনা আদিৰ নামত প্রচলিত বচনবিলাক কৃষিজীৱী ব্যক্তি আৰু সমাজৰ অভিজ্ঞতাৰ ফল। ডাক বচনত প্রাজ্ঞোক্তি আখ্যা নিদি লোকোক্তি আখ্যা দিয়া উচিত।[১] ডাক বা খনাৰ বচন - প্রবচনৰ দৰে ভাৰতৰ বিভিন্ন অঞ্চলত ডংক (ৰাজস্থান), ঘাঘ (উত্তৰ প্রদেশ), ভড্ডৰ (ৰাজস্থান), খনা (বাংলাদেশ, পশ্চিম বংগ) আদিৰ নামতো প্রচলিত আছে। এই বচন-প্রবচন বিলাক কৃষি, গৃহ, জন্ম, ধর্ম, ন্যায়, নীতি ৰন্ধন প্রণালী, জ্যোতিষ, যাত্রা, সু-পুৰুষ, সু-নাৰী, ঔষধি দ্রব্য আদি বিভিন্ন ৰূপত পোৱা যায়।

০.০.১ ডাকৰ জন্ম আৰু মৃত্যু ঃ

ডাকৰ জন্ম আৰু মৃত্যু সম্পৰ্কীয় জনশ্রুতিৰ বিভিন্ন উল্লেখ পোৱা যায় দেবেন্দ্র নাথ বেজবৰুৱাৰ 'অসমীয়া ভাষা আৰু সাহিত্যৰ বুৰঞ্জী'ত, সোণাৰাম চৌধুৰীৰ 'আৱাহন'ত প্রকাশিত 'ডাক পুৰুষৰ জীৱনী আৰু ৰচনাৱলী' শীর্ষক প্রবন্ধ পুথি, হেমৰথ বর্মনে সম্পাদনা কৰা 'সম্পূর্ণ ডাকৰ বচনত' ডাকৰ জন্ম আৰু মৃত্যু বিষয়ক বর্ণনা পোৱা যায়। কিন্তু মূল পুথিৰ বিষয়ে তেৰোঁ একো উল্লেখ কৰা নাই। ইয়াৰ পৰা অনুমান কৰিব পাৰি যে ডাকৰ জন্ম আৰু মৃত্যু সম্পৰ্কীয় কাহিনীভাগ সম্পূর্ণভাৱে মৌখিক পৰম্পৰাৰ পৰিসীমাত সীমিত।

১.০ বিষয়ৰ আলোচনা

১.১ গৃহ নির্মাণ ঃ

এটা পৰিপাটী সুন্দৰ স্বাস্থ্যসন্মত গৃহ নির্মাণ সম্পর্কে ডাকৰ নামত কেইবাটাও গুৰুত্বপূর্ণ উক্তি পোৱা যায়। তাৰে ভিতৰত দুটামান উল্লেখযোগ্য হৈছে —

(১) পূবে পচিমাকৈ সাজিবা ঘৰ
অকাল মৃত্যুক নাহিকে ডৰ।
ব্যাখ্যা - পূবে পশ্চিমকৈ ঘৰ সাজিলে মৃত্যু ভয় নাই।

(২) পচিমে বাঁহ পূবে বেত
উত্তৰে তামোল দক্ষিণে খেত।
ব্যাখ্যা - পশ্চিমে বাঁহ গছ, পূবে বেঁতৰ গছ, উত্তৰে তামোল আৰু দক্ষিণে কৃষি কৰিব লাগে।

(৩) পূবে ভাণ্ডাৰ পচিমে গোহালি
ডাকে বোলে তাৰ সকাল সুৱনি।।
ব্যাখ্যা - পূবে ভঁৰাল, পশ্চিমে গোহালি থাকিলে তাৰ সকলো ভাল।

১.২ কৃষি সম্পর্কীয় ঃ

অসম হৈছে কৃষি প্রধান ৰাজ্য। গতিকে কৃষি কেনেকৈ, কেতিয়া কৰিব লাগে এই সম্পর্কে ডাকৰ বচনত কেইবাটাও উক্তি পোৱা যায়। যেনে— গৰুহালৰ ওপৰত খেতি নির্ভৰ কৰে গতিকে ডাকে গৰুৰ লক্ষণ সম্পর্কে কৈছে।

(১) গৰু কিনিবা দীঘল নেজা।
মৈত দিলে নহয় কুজা।।

(২) ডাকে বোলে বাপ সুনা উপাই।
বাণিজ্যৰ ফল কৃষিতে পাই।।
জি নৰে সদা কৃষিক কৰে।
সেৱাৰ ফল পাইবা ঘৰে।।
ব্যাখ্যা - যি মানুহে কৃষি কর্ম কৰে তেওঁ বাণিজ্যৰ ফল ঘৰতে লাভ কৰে।

(৩) আহিনে কাতি ৰাখিবা পানী।
জেহেন ৰাখে ৰাজাৰ ৰাণী।।
ব্যাখ্যা - আহিন মাহত পথাৰত পানী এনেদৰে ৰাখিব লাগে যেনেদৰে ৰজাই ৰাণীক ৰাখে।

(৪) সাতে পাতাল পাচে ঘন।
চয়ে তামোল নদন-বদন।
ব্যাখ্যা - ছয় হাতৰ মূৰে মূৰে তামোল গছ ৰুলে নদন-বদন হয়।

(৫) তিনি শ ষাঠি জোপা ৰুবা কল মাহিলি
মাহিলি চিকুনাবা তল।।
পাত পচলা লাভতে খাবা
লংকাৰ বনিজ হাততে পাবা।।
ব্যাখ্যা - তিনিশ ষাঠি জোপা কল ৰুলে মানুহে ধুনীয়াকৈ খাই বৈ থাকিব পাৰিব বুলি কোৱা হৈছে। (ডাক-প্রবচন আৰু ডাক পৰম্পৰা, পৃ. ৩৭-৩৮)

১.৩ ৰন্ধন প্রণালী ঃ

মানুহৰ সু-স্বাস্থ্য নির্ভৰ কৰে খাদ্য প্রণালীৰ ওপৰত কোনটো খাদ্য কিহেৰে খালে উপাদেয় হয় আৰু কেনেকৈ ৰান্ধিব লাগে এই সম্পর্কে ডাকে এনেদৰে কৈ গৈছে—

(১) পকা তেতেলি বুঢ়া বৰালি।
বিস্তাৰ কৰিয়া দিবা জালি।।
ব্যাখ্যা - বৰালি মাছ পকা তেতেলি দি ৰান্ধিলে সোৱাদ তথা স্বাস্থ্যসম্মত হয়।

(২) ৰান্ধন শালত যাৰ নাবাজিল পটা।
স্নানৰ সময়ত জাৰ নভৈল ফোটা।।
শীত কালত যাৰ নাহিকে বস্ত্র।
যুদ্ধ সময়ত নাহিকে অস্ত্র।।
যজ্ঞ অৱসানে নাহি দক্ষিণা।
বোলন্ত ডাকে পাচো বিড়ম্বনা।
ব্যাখ্যা -যি ৰান্ধনী ঘৰত ভাত ৰন্ধাৰ সময়ত পটাত মচলা বটাৰ শব্দ নহয়, স্নানৰ পিছত যিজনে ফোটা নলয়, শীত কালত গাত ল'বলৈ যাৰ কাপোৰ নাই, অস্ত্র-শস্ত্র নোহোৱাকৈ যুঁজ কৰিবলৈ যোৱা কার্য আৰু যজ্ঞৰ সমাপ্তিত দক্ষিণা নোহোৱা এই পাঁচোবিধ কার্যই বিড়ম্বনা মাথোন।

(৩) জুইক দৃষ্টি সূর্যক পিঠি
কৰাই মুঠি মাহ গুটি।
ব্যাখ্যা -জুই পুৱাব লগে জুইকুৰা সমুখত ৰাখি, সূর্যৰ ফালে পিঠি দি ৰ'দ ল'ব লাগে। মুঠি মাৰি কৰাই খাব লাগে আৰু মাহৰ চেই এটি এটিকৈ খাব লাগে।

(৪) চিত জেৰোৱা চলি কাতি
বতা হেঙেৰা খাগৰা মুঠি।।
শ্বাস দীর্ঘ কৰি দিবা ফু।
তেবে দেখিবা জুইৰ মু।।
ব্যাখ্যা - ওপৰমুৱাকৈ জেৰোৱা খৰি আৰু কাতি কৰি চলি খৰি, মুঠি মাৰি খাগৰা দি উশাহ দীঘলকৈ লৈ ফু মাৰি দিলে, জুই জ্বলিব।

(৫) মাগুৰ মাচক কচি কুটিয়া।
হালধি মৰিচ হিঙ্গক দিয়া।।
তৈল লোন দি কৰিবা পাক।
এই বেঞ্জন সাৰ বোলে ডাক।।

ব্যাখ্যা - মাগুৰ মাচক কচি কাটিব লাগিব আৰু হালধি জলকীয়া হিঙ্গ দি ৰান্ধিলে সেই ব্যঞ্জন উপাদেয় হয়।

(৬) শলে মূলে, হাঁহে বাঁহে

ব্যাখ্যা - শ'ল মাছৰ লগত মূলা দি আৰু হাঁহৰ লগত বাঁহ গাজ দি ৰান্ধিব লাগে।

২.০ উপসংহাৰ আৰু সিদ্ধান্ত ঃ

ওপৰৰ আলোচনাৰ পৰা দেখা যায় যে 'ডাক'ৰ নামত আমাৰ বিভিন্ন বিষয়ক প্রকৰণ প্রচলিত হৈ আছে। এই প্রকৰণ বিলাকত কৃষি জীৱী সমাজ এখনৰ চিত্র প্রতিফলিত হৈছে। ইয়াত নাগৰিক জীৱনৰ ছবি আমি দেখিবলৈ পোৱা নাই। অসমীয়া সমাজত গৃহ নির্মাণ, কৃষি সম্পর্কত, ৰন্ধন প্রণালীত এই প্রকৰণ সমূহৰ মতে কৰিবলৈ চেষ্টা কৰা হয়। বর্তমান বিজ্ঞান প্রযুক্তি তথা বিশ্বায়নৰ ফলত বিভিন্ন গৃহ নির্মাণ সম্পর্কীয় গ্রন্থ তথা বিভিন্ন 'ৰেচিপি' প্রচলিত হৈছে যদিও ডাকে উল্লেখ কৰা মতে এটা ঘৰ সাজিবলৈ বা এজোপা গছ ৰোপন কৰিবলৈ তথা অসমীয়া গৃহিনীয়ে এসাঁজ থলুৱা খাদ্য ৰান্ধিবলৈ এই 'ডাকৰ বচন' সমূহত উল্লেখ থকা ৰীতিসমূহ বর্তমানেও মানি আহিছে বুলি আমি ক'ব পাৰোঁ। গতিকে এই ডাকৰ বচনসমূহত বৈজ্ঞানীক ভিত্তি আমি নুই কৰিব নোৱাৰো। এই আলোচনাৰ পৰা আমি তলত দিয়া **সিদ্ধান্ত**সমূহ উপনীত হ'ব পাৰো —

(১) ডাকৰ বচনসমূহ অসমীয়া লোক-সাহিত্যৰ এটা অন্যতম অংগ।

(২) অসমীয়া ডাকৰ বচনৰ দৰে ভাৰতৰ বিভিন্ন ৰাজ্যত ডংক, ঘাঘ, ভড্ডৰ, খনা আদিৰ নামত কিছুমান লোকোক্তি প্রচলিত আছে।

(৩) ইয়াত দৈনন্দিন জীৱনৰ বিভিন্ন লাগতিয়াল নীতিৰ উল্লেখ পোৱা যায়।

(৪) 'ডাক' নামৰ ব্যক্তি জনৰ জন্ম-মৃত্যু সম্পর্কীয় কাহিনীভাগৰ বিভিন্ন জনশ্রুতি আছে।

(৫) ডাকৰ বচনসমূহ বর্তমানেও অসমীয়া জনসমাজত মানি চলা হয়।

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তথ্য সূত্র ঃ

১। শর্মা, নবীনচন্দ্র ঃ ডাক প্রবচন আৰু ডাক পৰম্পৰা পৃ. ১৭৮

সহায়ক গ্রন্থপঞ্জী ঃ

১। শর্মা, সত্যেন্দ্রনাথ ঃ অসমীয়া সাহিত্যৰ সমীক্ষাত্মক ইতিবৃত্ত
অৰুণোদয় প্রেছ, গুৱাহাটী-৩, সপ্তম সংস্কৰণ, ১৯৯৬

২। শর্মা, নবীনচন্দ্র ঃ অসমৰ লোকসাহিত্য
জ্যোতি প্রকাশন, পানবজাৰ-১, প্রথম প্রকাশ, ২০১৪

৩। ঐ ঃ ডাক প্রবচন আৰু ডাক পৰম্পৰা
জ্যোতি প্রকাশন, পানবজাৰ-১, প্রথম প্রকাশ, ২০০৫

৩। হাজৰিকা, বিশ্বেশৰ ঃ অসমীয়া সাহিত্যৰ বুৰঞ্জী (প্রথম খণ্ড)
আনন্দ ৰাম বৰুৱা ভাষা-কলা-সংস্কৃতি সংস্থা, ৰজাদুৱাৰ,
উত্তৰ গুৱাহাটী- ৩০, প্রথম প্রকাশ (ডিচেম্বৰ, ২০০৩)

প্ৰাচীনতম যুগত ভাৰতীয়ৰ গণিত মানসিকতা

ড° হৃষিকেশ বৰুৱা
সহকাৰী অধ্যাপক, গণিত বিভাগ,
দুলীয়াজান মহাবিদ্যালয়

সাৰাংশ ঃ

মানুহৰ মাজত থকা কলা-মানসিকতা গুণৰ বাবে মানৱ সভ্যতা অগ্ৰগতিৰ জখলাত দোপে দোপে আগবাঢ়ি গৈ আছে। এই কলা-মানসিকতাৰ লগত জড়িত হৈ আছে মানুহৰ চিন্তা কৰিব পৰা শক্তি, নতুন সৃষ্টিৰ আনন্দ আৰু সৌন্দৰ্য্য উপভোগ কৰাৰ সামৰ্থ্য। এই কলা-মানসিকতাৰ বাবেই গণিত মানসিকতাৰ পুৰিপুষ্টি সাধন হৈছে আৰু তাৰেই ফলত মানৱ সভ্যতাৰ অগ্ৰগতিৰ সম্ভৱ হৈছে। গণিত মানসিকতাৰ অবিহনে যেনেদৰে কোনো মহৎ কলাৰ সৃষ্টি হ'ব নোৱাৰে একেদৰে কলা-মানসিকতাৰ অবিহনেও কোনো উচ্চ স্তৰৰ গণিতৰ সৃষ্টি হ'ব নোৱাৰে।

প্ৰস্তাৱনা ঃ

মানৱ সভ্যতাৰ ক্ৰমবিকাশৰ লগত গণিতৰ ক্ৰমবিকাশ ওতঃপ্ৰোতভাৱে জড়িত হৈ আছে। সভ্যতাৰ অগ্ৰগতিৰ বাবে আৱশ্যক সামাজিক শৃঙ্খলা আৰু সু-সংহত চিন্তাধাৰাৰ। সু-সংহত চিন্তাধাৰাকে গাণিতিক চিন্তাধাৰা অথবা গণিত মানসিকতা বুলি ক'ব পাৰি। সভ্যতাৰ আৰম্ভণিতে সু-সংহত চিন্তাধাৰা অভিব্যক্ত হৈছিল গণিত সৃষ্টিৰ যোগেদি। সভ্যতাৰ ক্ৰমবিকাশ আৰম্ভণিৰ লগে লগে মানুহৰ মনত গাণিতিক ধাৰণাৰ উদ্ৰেক হৈছিল। প্ৰাচীনতম গাণিতিক ধাৰণ হ'ল আৰ্হি বা আকৃতিৰ ধাৰণা (concept of form or shape), গণনা আৰু সংখ্যাৰ ধাৰণা (concept of counting and numbers) আৰু জোখ মাপৰ ধাৰণা (concept of measure or magnitude)। এইকেইটা ধাৰণা লগত জড়িত হৈ আছে (১) দুটা আৰ্হি বা আকৃতিৰ মাজত মিল বা অমিল চিনাক্ত কৰিব পৰা মানসিক সামৰ্থ্য, (২) বহুতো বস্তুৰ মাজৰ পৰা নিৰ্দিষ্ট সংখ্যক বস্তু পৃথক কৰিব পৰাৰ মানসিক পৰিপক্কতা আৰু (৩) দুটা বস্তুৰ মাজৰ পৰা ডাঙটো অথবা সৰুটো বাচি উলিওৱাৰ মানসিক ক্ষমতা। সময়ৰ লগে লগে গণিত মানসিকতাই পৰিপক্কতা লাভ কৰে। মানুহৰ মাজত থকা কলা-মানসিকতা গুণৰ বাবে মানৱ সভ্যতা অগ্ৰগতিৰ জখলাত দোপে দোপে আগবাঢ়ি গৈ আছে। এই কলা-

মানসিকতাৰ লগত জড়িত হৈ আছে মানুহৰ চিন্তা কৰিব পৰা শক্তি, নতুন সৃষ্টিৰ আনন্দ আৰু সৌন্দর্য্য উপভোগ কৰাৰ সামর্থ্য। এই কলা-মানসিকতাৰ বাবেই গণিত মানসিকতাৰ পুৰিপুষ্টি সাধন হৈছে আৰু তাৰেই ফলত মানৰ সভ্যতাৰ অগ্রগতিৰ সম্ভৱ হৈছে। গণিত মানসিকতাৰ অবিহনে যেনেদৰে কোনো মহৎ কলাৰ সৃষ্টি হ'ব নোৱাৰে একেদৰে কলা-মানসিকতাৰ অবিহনেও কোনো উচ্চ স্তৰৰ গণিতৰ সৃষ্টি হ'ব নোৱাৰে। *[১]*

বিষয়বস্তুৰ ওপৰত আলোচনা ঃ

১০০০ খ্রীষ্টপূর্বৰ পূর্বে ভাৰতীয় গণিত কি পর্য্যায়ত আছিল সেই বিষয়ে জানিবলৈ পর্যাপ্ত নথি-পত্রৰ অত্যন্ত অভাৱ। এই অঞ্চলৰ প্রাচীনতম গণিত-চর্চ্চাৰ কিছু আভাস পোৱা যায় মহেঞ্জোদাৰো আৰু হৰপ্পাত উদ্ধাৰ কৰা ধ্বংসাৱশেষৰপৰা। সিন্ধু উপত্যকাত গঢ় লৈ উঠা এই সভ্যতা কিমান দিনৰ পুৰণি সেইটো বুৰঞ্জীবিদ আৰু পুৰাতত্ত্ববিদসকলে তর্কাতীত ভাবে স্থিৰ কৰিব পৰা নাই। তথাপিও এই সভ্যতা অতি কমেও *৫০০০* হেজাৰ বছৰ পুৰণি অর্থাৎ *৩০০০* খ্রীষ্টপূর্বৰ আগৰ বুলি প্রায় নিশ্চিত হোৱা গৈছে। এই সভ্যতা যে অতি উচ্চ মানদণ্ডৰ আছিল সেই বিষয়ে কোনো সন্দেহ নাই। বহল ৰাস্তা, পকী ইটাৰে নির্মিত ঘৰ, ঢাকনি দিয়া নলা-নর্দ্দমা, সুন্দৰ গা ধোৱা পুখুৰী আৰু টাইল লগোৱা গা ধোৱা ঘৰ আদিৰ চিন পোৱা গৈছে। সেই সময়ৰ লোকৰ অভিযান্ত্রিক জ্ঞান যে অতি উচ্চ খাপৰ আছিল সেইটো অনস্বীকার্য্য। এনে অভিযান্ত্রিক কৌশল আহৰণ কৰিবৰ বাবে গণিতৰ জ্ঞান কিমান গভীৰ হ'ব লাগিব অনুমান কৰিব পাৰি। উচ্চ খাপৰ জ্যামিতিক জ্ঞানৰ অবিহনে এনে নির্মাণ কার্য্য সম্ভৱ নহয়, লগতে পৰিমিত (mensuration)ৰ প্রয়োগ অপৰিহার্য্য। পৰিমিতিৰ জ্ঞান নির্ভৰ কৰে জোখ-মাপ আৰু সংখ্যাৰ ব্যৱহাৰৰ ওপৰত। গতিকে এই কেইটা বিষয়ৰ যথেষ্ট উচ্চ খাপৰ গণিত চর্চ্চা সেই সময়ত হৈছিল বুলি ধৰি লোৱাটো ভুল নহ'ব।

সিন্ধু উপত্যকাৰ এই সভ্যতাৰ কেনেকৈ বিলুপ্তি ঘটিল সেইটো জনা নাযায়। এই সভ্যতাৰ বিলুপ্তিৰ প্রায় *১০০০* বছৰ পিছত, অর্থাৎ প্রায় দুহেজাৰ খ্রীষ্টপূর্বত আর্য্যসকল ভাৰতলৈ আহে বুলি জনা যায়। আর্য্যসকল ভাৰতলৈ অহাৰ পিছত প্রথম *১০০০* বছৰৰ ভিতৰতে কথিত আৰু লিখিত সংস্কৃত ভাষাই গঢ় লৈ উঠে বুলি অনুমান কৰা হয়। ভাৰতৰ প্রাচীনতম গ্রন্থ হ'ল চতুর্বেদ। তাৰ ভিতৰত ঋক বেদেই আটাইতকৈ পুৰণি। বেদৰ স্তোত্রবোৰ পুৰুষানুক্রমে মুখে মুখে চলি আহিছিল বুলি জনা যায়। গতিকে বেদৰ স্তোত্রবোৰ প্রকৃততে কিমান পুৰণি সেইটো ঠাৱৰ কৰা অতি কঠিন। খ্রীষ্টপূর্ব দ্বিতীয় সহস্রাব্দত সংস্কৃত ভাষাৰ বিকাশ হোৱা বুলি ধৰি ল'লে বেদৰ স্তোত্রসমূহো খ্রীষ্ট জন্মৰ *১৫০০* বছৰমানৰ আগৰ বুলি ধৰিব পাৰিব। বেদসমূহত, বিশেষকৈ ঋক্ বেদত, গণিতসম্বন্ধীয় ভালেমান উক্তি আৰু তথ্য আছে। এই গাণিতিক তথ্যসমূহ বেদৰ স্তোত্রসমূহ ৰচনা কৰা কালতকৈ বহুত আগৰো হ'ব পাৰে, কিয়নো সেই সময়ত জানিব পৰা সকলো তথ্যকেই হয়তো এই স্তোত্রবোৰত প্রকাশ কৰা হৈছিল। *[২]* সেই ফালৰপৰা চাবলৈ গ'লে বেদত উল্লেখ থকা গাণিতিক তথ্যসমূহৰ বহু অংশ *২০০০* খ্রীষ্টপূর্বৰ আগৰ হোৱাটোও অসম্ভৱ নহয়।

বেদত উল্লেখ কৰা সংখ্যাবোৰ *১০*ৰ ঘাতত প্রকাশ কৰা হৈছিল — দশ শত, সহস্র, অয়ুথ, ইত্যাদি। এনে প্রকাশ ভংগীত বর্ত্তমানে প্রচলিত দশমিক পদ্ধতিৰ ৰেঙণি দেখিবলৈ পোৱা যায়। বেদত উল্লেখ থকা সংখ্যাবোৰৰপৰা এই কথাও সুস্পষ্ট হৈ পৰে যে সেই সময়ৰ মানুহে অতি বৃহৎ সংখ্যা ব্যৱহাৰ কৰা প্রয়োজনীয়তা উপলব্ধি কৰিছিল আৰু ব্যৱহাৰ কৰিব জানিছিল।

ঋক বেদৰ পৰা জানিব পাৰি যে সেই সময়ৰ পুৰোহিতসকলৰ জ্যোতির্বিজ্ঞানৰ জ্ঞান যথেষ্ট উচ্চ খাপৰ আছিল। উদাহৰণস্বৰূপে আত্রি পৰিয়ালৰ পুৰোহিতসকলে সূর্য্য-গ্রহণৰ ভৰিষ্যদ্বাণী কৰিব পাৰিছিল বুলি উল্লেখ আছে।

যজু ঃ বেদত ইয়াৰো উল্লেখ আছে যে এটা সম্পূর্ণ বছৰ ৩৬৫ দিনতকৈ বেছি কিন্তু ৩৬৬ দিনতকৈ কম। জ্যোতির্বিজ্ঞানৰ ই এটা অতি গুৰুত্বপূর্ণ আৱিষ্কাৰ। এখন নির্ভুল কেলেণ্ডাৰ প্রস্তুত কৰি উলিয়াবৰ বাবে এই তথ্যা আছিল অতি প্রয়োজনীয়। কিয়নো কেলেণ্ডাৰ প্রস্তুত কৰোতে লিপ্ ইয়েৰৰ (ফেব্রুৱাৰী মাহ ২৯ দিনীয়া) ধাৰণাৰ আৱশ্যকতা এই কাৰণেই আহি পৰিছিল।

বেদত পাদ (চাৰি ভাগৰ এভাগ), অর্ধ (দুভাগৰ এভাগ), ত্রিপাদ (চাৰি ভাগৰ তিনি ভাগ) আদি শব্দ পোৱা যায়। এইবোৰে লেখকৰ ভগ্নাংশ অথবা পৰিমেয় সংখ্যাৰ জ্ঞানৰ কথাকেই বুজায়। কিন্তু বৈদিক যুগৰ গণিত মুখ্যতঃ জ্যোতির্বিজ্ঞান সম্পর্কীয় গণিত বুলি ক'ব পাৰি। বেদত অন্তর্ভুক্ত যজ্ঞৰ বেদী ৰচনাৰ নিয়মাৱলীয়ে সুষম জ্যামিতিক চিত্রৰ ব্যৱহাৰৰ কথাকে বুজায়।

ভাৰতীয় গণিতৰ সুসংহত ইতিহাস সপ্তম শতিকাৰ মোগল আক্রমণৰ পিছৰপৰাহে জানিব পৰা যায়। ১০০০ খ্রীষ্টপূর্বৰপৰা ৩০০ খ্রীষ্টপূর্বলৈকে এই কালছোৱাৰ ভাৰতীয় গণিতৰ বিষয়ে জানিবৰ একমাত্র সম্বল হ'ল বৈদিক সাহিত্য আৰু বৌদ্ধ ধর্মৰ প্রচাৰৰ বাবে ৰচনা কৰা ধর্মীয় লিখনীসমূহ। কিন্তু এইবোৰৰ ৰচনা কাল সম্বন্ধে সঠিককৈ জানিব পৰা নাযায়। বহুতৰ অনুমান যে বেদকেইখনৰ ৰচনা প্রায় ৮০০ খ্রীষ্টপূর্বৰ আগতেই সম্পূর্ণ হৈছিল। *[৩]* সেইদৰে বেদাংগসমূহৰ ৰচনাও বৰ বেছিদিন পিছৰ নহয়। গতিকে বেদ আৰু বেদাংগত অন্তর্নিহিত হৈ থকা গণিত আমাৰ আলোচ্য কালছোৱাৰ পূর্বৰ বুলি অনুমান কৰিব পাৰি।

প্রাচীন ভাৰতৰ আন এখন বিখ্যাত গণিতৰ পুথি হ'ল শুল্বসূত্র। বুদ্ধদেৱৰ সময়তেই পাণিনিৰ ব্যাকৰণ আৰু শুল্বসূত্র ৰচনা কৰা হৈছিল বুলি অনুমান কৰা হয়। শুল্বসূত্রৰ প্রকৃত ৰচয়িতাৰ নাম গম পোৱা নাযায়। অপস্তম্ব, বৌধায়ন আৰু কাট্যায়ন নামৰ তিনিজন গণিতজ্ঞই শুল্বসূত্রৰ বেলেগ বেলেগ ব্যাখ্যা মূলক টীকা প্রস্তুত কৰিছিল। শুল্বসূত্রত অন্তর্ভুক্ত গণিত যে কোনো এজন বিশেষ ব্যক্তিৰ আৱিষ্কাৰ নহয় সেই বিষয়ে সন্দেহ নাই। শুল্বসূত্রৰপৰা সেই সময়ৰ ভাৰতীয় গণিতৰ এটা আভাস পোৱা যায়। শুল্বসূত্রৰ অর্থ হ'ল 'সূতাৰ নিয়ম'। শুল্বসূত্রক মুখ্যতঃ ধর্মীয় নীতি-নিয়মৰ বিধান সম্বলিত পুথি বুলিহে ক'ব পাৰি। পূজাৰ বেদী আদি প্রস্তুত কৰিবৰ বাবে বিভিন্ন আর্হিৰ জ্যামিতিক চিত্র অংকন কৰাৰ পদ্ধতি ইয়াত দিয়া হৈছে। এনেবোৰ পদ্ধতিত সেই সময়ৰ জ্যামিতিক জ্ঞান, আৰু লগতে সংখ্যাৰ জ্ঞান, প্রতিফলিত হৈছে। শুল্বসূত্রৰপৰা দুটা কথা স্পষ্টকৈ জানিব পাৰি— পাইথাগোৰীয় ত্রয় উলিওৱাৰ নিয়ম ভাৰতীয় গণিতজ্ঞয়ো জানিছিল আৰু অপৰিমেয় সংখ্যাৰ ধাৰণা তেওঁলোকৰ অবিদিত নাছিল। অৱশ্যে এনে নিয়ম আৰু এনে ধাৰণা যে গণিতত সেই সময়ত সম্পূর্ণ নতুন নাছিল। *[৪]*

বৌদ্ধ ধর্মাৱলম্বীসকলৰ আন এখন পৱিত্র পুথি ললিতবিস্তাৰত বুদ্ধদেৱৰ গাণিতিক (সাংখ্যিক) দক্ষতাৰ গুণানুকীর্তন কৰা হৈছে। শুল্বসূত্র আৰু ললিতবিস্তাৰৰ বিষয়বস্তুৰপৰা এইটো অনুমান কৰিব পাৰি যে সেই সময়ত ভাৰতত প্রায়োগিক আৰু মৌলিক এই দুয়োবিধ গণিতৰ চর্চ্চা সমানেই হৈছিল।

মৌর্য্য সকলৰ শাসন কালত ভাৰতবর্ষত গণিত চর্চ্চাৰ (অথবা জ্যোতির্বিজ্ঞান চর্চ্চাৰ) স্বাক্ষৰ বহন কৰা দুখন জ্যোতির্বিজ্ঞান সম্বন্ধীয় পুথিৰ কথা জনা যায়। এই পুথি দুখন হ'ল জ্যোতিষ বেদাংগ আৰু সূর্য্যপ্রজ্ঞাপ্তি। এই পুথি দুখনৰপৰা এইটো সুস্পষ্ট হৈ পৰে যে ইতিমধ্যে গ্রীক গণিতৰ লগত ভাৰতীয় গণিতজ্ঞৰ পৰিচয় ঘটিছিল। ইয়াৰ এটা কাৰণ আলেকজেন্দাৰৰ ভাৰত আক্রমণো হ'ব পাৰে। এই দুখন পুথি সংস্কৃত ভাষাত লিখা হৈছিল যদিও ইয়াত উল্লেখ কৰা কেতবোৰ গাণিতিক শব্দ গ্রীক শব্দৰ অপভ্রংশ বুলি কোনো কোনোৱে মত পোষণ কৰে। গণিতৰ বুৰঞ্জীৰ এজন বিশেষজ্ঞ অধ্যাপক ডেভিদ ইউগিনি স্মিথৰ মতে জ্যমিত্র, কেন্দ্র, দ্রম্ম আদি শব্দবোৰ গ্রীক অপভ্রংশ। এই দুখন পুথিৰ বিষয় বস্তু খুব উচ্চ খাপৰ নহ'লেও পঞ্চম শতিকাৰ মহৎ

ভাৰতীয় সৃষ্টি জ্যোতির্বিজ্ঞান বিষয়ৰ পুথি সূর্য্য সিদ্ধান্তৰ লিখক এই দুখন পুথিৰ বিষয় বস্তুৰ দ্বাৰা প্রভাৱান্বিত হৈছিল বুলি নিশ্চয়কৈ ক'ব পাৰি। উল্লেখযোগ্য যে সূর্য্যসিদ্ধান্তৰ ৰচনা গুপ্তসকলৰ শাসন কালতেই হৈছিল। দৰাচলতে গুপ্ত সাম্রাজ্যৰ কালছোৱাতেই ভাৰতীয় গণিত আৰু বিজ্ঞানৰ সোণালী যুগৰ সূচনা হৈছিল। প্রায় ১০০০ খ্রীষ্টাব্দলৈকে ভাৰতীয় গণিতৰ বিকাশ আৰু প্রসাৰ অব্যাহত আছিল। এই সময়ছোৱাৰ ভিতৰতেই ভাৰতীয় সংখ্যা-পদ্ধতিৰ (Indian numeral system) প্রচলন হয় বুলি বিশেষজ্ঞসকল একমত। সংখ্যা পদ্ধতিত স্থানীয় মানৰ ধাৰণা (concept of place value) আৰু শূন্যৰ প্রয়োগ এই সময়ৰ পৰাই হ'বলৈ ধৰে। গণিত মানসিকতাৰ ক্রমবিকাশৰ ক্ষেত্রত ভাৰতবর্ষৰ ই এক অমূল্য অৱদান। এই সংখ্যা পদ্ধতি আধুনিক গণিতৰ এক অবিচ্ছেদ্য অংগ। *[৩]*

মৌর্য্য সাম্রাজ্যৰ পতন আৰু কুশান সাম্রাজ্যৰ অভ্যুত্থানলৈকে এই প্রায় ৩৫০ বছৰ কাল বহুবাৰ উত্তৰফালৰ পৰা সামৰিক অভিযানে ভাৰতবর্ষৰ ৰাজনৈতিক স্থিৰতা ভংগ কৰিছিল। যিহেতু যি কোনো ধৰণৰ সৃজনীমূলক কামৰ বাবে দেশৰ আভ্যন্তৰীণ ৰাজনৈতিক স্থিৰতাৰ অতি প্রয়োজন। সেইবাবে এই কালছোৱাত স্বাভাৱিকতেই ভাৰতবর্ষত গণিত চর্চ্চাৰ ক্ষেত্রতো যতি পৰিছিল। শুল্বসূত্রৰ পিছতে সূর্য্যসিদ্ধান্তই উল্লেখনীয় ভাৰতীয় গণিতৰ পুথি বুলি ক'ব পাৰি। শুল্বসূত্র প্রকৃতার্থত গণিতৰ পুথি বুলি অৱশ্যে ক'ব নোৱাৰি। বৰঞ্চ ধর্মীয় নীত-নিয়ম গাণিতিক সূত্র বুলিহে ক'ব পাৰি। কিন্তু সূর্য্য সিদ্ধান্তত পূৰামাত্রাই গণিতৰ পুথি। সূর্য্য সিদ্ধান্তত কোনো ধর্মীয় গোন্ধ পোৱা নাযায়।

সীমাৱদ্ধতা ঃ

পঞ্চম, ষষ্ঠ আৰু সপ্তম শতিকাত ভাৰতবর্ষত তিনিজন বিখ্যাত গণিতজ্ঞৰ জন্ম হৈছিল। এওঁলোক হ'ল ক্রমে আর্যভট, বৰাহমিহিৰ আৰু ব্রহ্মগুপ্ত। এই তিনিজন গণিতজ্ঞই গণিতৰ জগতলৈ অমূল্য অৰিহণা আগ বঢ়াই থৈ গৈছিল। অষ্টম শতিকাৰ পিছত আৰবী অনুবাদৰ যোগেদি এওঁলোকৰ ৰচনাৱলী ইউৰোপ পায়গৈ। পৰৱর্তী কালৰ ইউৰোপীয় তথা বিশ্বৰ গণিতৰ ওপৰত এওঁলোকৰ ৰচনাৱলীৰ গভীৰ প্রভাৱ পৰিলক্ষিত হৈছিল। বৰাহমিহিৰে ৰচনা কৰা পুথি এখনৰ নাম পঞ্চসিদ্ধান্তিকা। পাঁচবিধ "সিদ্ধান্তৰ" ওপৰত লিখা এই পুথিৰ প্রথম 'সিদ্ধান্তৰ" নামো "সূর্য্য সিদ্ধান্ত"। কোনো কোনোৱে ক'ব খোজে যে পূর্বতে উল্লেখ কৰা সূর্য্য সিদ্ধান্ত পুথিখন বেলেগ পুথি নহয়। যদি সেয়ে হয়, তেনেহ'লে সূর্য্য সিদ্ধান্তৰ ৰচনা কাল ষষ্ঠ শতিকা বুলিহে ক'ব লাগিব। আন এচামে ক'ব খোজে যে পূর্বৰ সূর্য্য সিদ্ধান্তৰ ওপৰত ভিত্তি কৰিয়েই বৰাহমিহিৰে তেওঁৰ সূর্য্যসিদ্ধান্ত ৰচনা কৰিছিল। উল্লেখযোগ্য যে দুয়োখনৰ মাজত যথেষ্ট মিল আছে। কিন্তু বৰাহমিহিৰৰ সূর্য্যসিদ্ধান্ত আগৰ সূর্য্য সিদ্ধান্ততকৈ বহুতো উন্নত। এনেস্থলত দুয়োখন সূর্য্য সিদ্ধান্ত একেজন গণিতজ্ঞৰে ৰচনা বুলি ভবাটো একে কোবেই ভুল বুলি ক'ব নোৱাৰি।

সামৰণি ঃ

বহুতো প্রাচীন ভাৰতীয় গ্রন্থৰ ৰচনা কাল সঠিকভাৱে নিণর্য় কৰাটো অতি দুৰূহ কাম হৈ পৰিছে। প্রাচীন গ্রন্থ প্রণেতা আৰু বুৰঞ্জী-প্রণেতা সকলে কালক্রম (chronology) অনুৰক্ষণৰ ওপৰত বৰ কম গুৰুত্ব দিয়া যেন লাগে। সপ্তম-অষ্টম শতিকাৰ পিছৰ পৰাহে ভাৰতীয় পুথিসমূহৰ ৰচনাৰ সময় প্রায় সঠিকভাৱে জানিব পৰা যায়।

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সহায়ক গ্ৰন্থ ঃ

(১) দৈনিক গনিত - আৰ, এম্ ভগৱত,
(২) শ্ৰীনিবাস ৰামানুজন - সুৰেশ ৰাম,
(৩) জ্যোতিষ বিদ্যা যুক্তি নে ভ্ৰান্তি- বিমান বসু
(৪) গনিতৰ ক্ৰমবিকাশৰ ইতিহাস- ড° বুদ্ধ প্ৰসাদ চেতিয়া
(৫) অমিতেজা গণিতজ্ঞ - ড° দিলীপ শৰ্মা, অসম প্ৰকাশন পৰিষদ