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AL04252

EMPOWERING WOMEN IN THE FISHERIES: A NECESSITY FOR SUSTAINABLE DEVELOPMENT

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Women empowerment, a global befitting revelation, steers countries towards growth, bridging socio-economic disparity, and promoting gender equity. Today's exploration aims to dissect women empowerment in our modern society through fisheries, seeking to shed light on its influence and assess the constraints inhibiting its full spectrum realisation. Women empowerment advocates for women to access control over resources and decisions, reaffirming their rightful place as pivotal contributors to society (World Bank, 2021). Hinged upon an egalitarian vision, women empowerment fuels positive societal transformation by celebrating and advancing women's significant societal contributions. In the patriarchal tapestry of most societies, a popular misconception has been woven that the realm of fisheries predominantly belongs to men. A crusty stereotype is perpetuated, ignoring the significant contributions made by women in the fisheries sector worldwide. This essay hinges on the declaration that empowerment of women in fisheries is essential because of their substantial contribution to the sector, the need for *gender equity*, and the potential *socio- economic* benefits they bring.

Women in Fisheries

Women's role in fisheries is a topic sparsely illuminated. The impression that fishing is all about casting nets and catching fish shows a lack of understanding of the full scope of fisheries (FAO, 2019). From net-making, baiting, fish processing, and marketing to management roles, women's participation has been substantial. According to a report by the Food and Agriculture Organization (2019), women constitute about 14% of all people directly employed in the capture fisheries sector globally. Their roles, although often less visible, shouldered the back-end jobs that ensured the functioning of this sector.

The pillar for empowering women in fisheries stems from the universal need for gender equality. Justice and fairness are not exclusive to any particular sector. Hence, gender

equity in fisheries is a cause worth fighting for. According to the World Bank report (2014), embracing gender equality in industries such as fisheries could lead to increased productivity, more sustainable outcomes and improve overall well-being of communities. The UN Women's report (2020) further highlighted the importance of gender-responsive policies for understanding and ameliorating the challenges faced by women in the sector.

Socio-Economic Benefits of Women Empowerment

Empowering women in fisheries also reaps economic benefits. When women wield economic power, they can upturn not only their lives but the whole local economy. Unleashing their full potential in fisheries could catalyze rural development and reduce poverty (World Fish Center, 2012). A report from the World Fish Center (2012) found that in developing countries, women's income from fisheries activities was often channeled into household expenditures, thereby bettering the family's nutrition and educational opportunities.

The economic implications of women empowerment in fisheries is corroborated by a study commissioned by the International Centre for Research on Women (2019). It emphasizes that investing in women's productive capabilities in the fisheries sector can lead to increased productivity and profitability. Therefore, tearing down the gender stereotypes around 'suitable jobs for women' can actually reap benefits for all involved. However, while these benefits are substantial, entrenched gender norms and biases prevent women from fully engaging in and benefiting from the fisheries sector. A considerable gender gap exists; globally, women earn, on average, 64 per cent of what their male counterparts earn for the same work (World Economic Forum, 2020). These gender disparities could be mitigated through more supportive policies and interventions that recognise and promote women's contributions.

Challenges Faced by Women

1. **Limited access to land:** In many countries, men tend to have exclusive land ownership, making it difficult for women to access land for activities like aquaculture
2. **Lack of control over resources:** Even when women can access resources, they may not have effective control over how to use them. For example, women working in homestead ponds may have little decision-making power over them.

3. **Gender norms:** Gender norms and expectations can limit women's adoption and use of aquaculture knowledge, technologies, and practices. For instance, in some cultures, certain tasks like harvesting in aquaculture ponds are seen as "men's work," making it socially taboo for women to participate.
4. **Limited mobility:** Women's primary responsibility for managing the household and caregiving can limit their time available for paid work and restrict their ability to travel far from home.
5. **Time and labor burdens:** Women often face multiple burdens, including managing the household, childrearing, and caring for sick or aging relatives. This can create a heavier workload for women and limit their ability to engage in income-generating activities.
6. **Insecurity in informal work:** Women in the fisheries and aquaculture labor force often lack social protection, employment contracts, and benefits. They may also be underrepresented in policy discussions, which hinders their ability to have decent work.
7. **Entrepreneurship challenges:** Women in some countries may face challenges in sustaining entrepreneurial ventures compared to men. Factors such as lack of finances, limited access to assets, and gender norms can contribute to women discontinuing businesses.

Strategies to Overcome the Challenges

Addressing gender barriers is crucial for achieving gender equality and empowering women in fisheries and aquaculture. Strategies to overcome these barriers include creating pro-equality gender policies, promoting women's entrepreneurship, providing access to finance and resources, challenging gender norms, and recognizing and addressing the time and labor burdens faced by women.

To fully grasp the extent and importance of women's involvement in fisheries, a renewed comprehension of the *fisheries' value chain* concept is pivotal. value chain includes not only the stages involved in harvesting but also in processing and selling fishery products, all of which fall under women's purview (FAO, 2016). Consequently, strengthening the position of women in the fisheries sector starts by acknowledging their vast contribution to the value chain and enhancing their visibility within it. Value chain interventions should be

gender-sensitive and customized to address the specific needs and challenges faced by women in the fishing industry.

Education and training are indispensable tools for empowerment. The issue at hand is not a lack of willingness or capacity to learn, but a lack of opportunity. Providing women with equal access to education and technical training in fisheries science, market strategies, business management and financial literacy not only builds their capacities but promotes their financial independence and autonomy - keys to empowerment.

Institutional reforms also play a crucial role in fostering gender equity in the fisheries sector. This includes engendering fisheries-related policies to enforce laws that promote the employment and protection of women in fisheries (HDR, 2013). Provisions such as ensuring safety and health standards, decent working hours and payment of fair wages must be ensured for women in the sector.

Support must also be given to *women's organizations and cooperatives* in the fisheries. Women working together can provide mutual support, share knowledge, improve bargaining power and contribute to policy-making processes (Weeratunge et al., 2010). Encouraging these collective actions can also protect their interests and uphold their rights, making the sector more equitable.

Lastly, there's a need to foster an environment that encourages and values the participation of women in decision-making processes at all levels, from local fisheries management to national and international policy-making fora. Inclusive decision-making not infrequently leads to improved societal outcomes and greater resource sustainability (Aguilar, 2008)

Conclusion

In conclusion, the empowerment of women in the fisheries sector is conceptually and pragmatically essential. By empowering women in fisheries, we are not merely advocating for gender equality. Instead, we're setting the stage for magnified economic growth opportunities that can propel our societies forward. The broader community rarely acknowledges the significant contribution that women make within the fisheries sector. This overlooks the potential for sustainable growth and development that could be acquired by empowering these women. It's imperative therefore, that this sector takes the necessary steps to recognise, equally educate, protect and encourage the active participation of women in

decision-making processes. The strategies outlined above not only serve to empower women in the sector but also set a firm foundation for the sustainable development of the fisheries sector providing an equitable future for all.

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BRIDGING THE GAP: ENHANCING AQUACULTURE WITH TRAPA IN INTEGRATED FARMING

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In India, one of the significant minor fruit crops is water chestnut (*Trapa natans*), commonly known as 'singhada' in Hindi. It is a perennial submerged plant produced as an 'aquatic nut crop' in tropical and subtropical areas. It is an excellent source of vitamins, fiber, and carbohydrates; therefore, it is widely used as a food crop in many regions of the world.

Farmers can diversify their crops and benefit from the optimal conditions in the area by adding water chestnut farming to aquaculture systems. Additionally, the incorporation of water chestnut cultivation with fish farming benefits both industries, as fish excrement acts as a natural fertilizer for the plants, promoting their growth. This mutually beneficial connection improves resource efficiency and eliminates waste, making farming more sustainable. Furthermore, there are several economic potentials associated with water chestnut farming.

The crop is currently in high demand in local and regional markets, providing farmers with an alternative source of additional revenue. By incorporating water chestnuts into aquaculture systems, farmers can improve food security, diversify their crops, and promote a more nutritious diet.

Implementation of Integrated Fish Farming With Water Chestnut

1. Selection of Suitable Water Bodies

The first step in establishing water chestnut and fish farming is selecting appropriate water bodies. Water chestnut flourishes in the soft, nutrient-rich waters of lakes, ponds, and streams with pH ranges from neutral to slightly alkaline. On the other hand, efficient fish rearing requires ponds, reservoirs, or tanks with a continuous water supply and adequate

depth. Water chestnuts can also be grown in areas with low-lying marshy soil or shallow water bodies where fertile, well-drained soil is available.

2. Establish the water chestnut

The water chestnut can be planted in the spring, with the tubers placed approximately 6 inches deep and 12 inches apart.

3. Selection of species

In India, two main varieties of water chestnuts are cultured: *Trapa bispinosa* (singhada nut) and *Trapa bicornis* (ling nut). To select suitable fish species for cultivation, consider factors such as market demand, ecological compatibility, and the capacity to adapt to local conditions. Common species in this context include Rohu, Catla, and Tilapia. For advice on selecting fish species, it is advisable to consult local fisheries authorities or specialists.

4. Pond Preparation for Fish Farming and cultivation of trapa

To prepare for fish farming, it is important to remove pond waste and undesirable aquatic plants, as well as to protect the pond from predators by placing barriers. After pond preparation, supply the pond with fingerlings of selected fish varieties. Maintain ideal conditions for fish growth by constantly monitoring water quality parameters. Additionally, plant water chestnut corms in the proper season, and fertilize and control weeds as needed.

5. Nutrient Cycling and Pond Management

One of the most important features of integrated farming is the use of nutrient cycling. The uneaten feed and excreta from fish provide essential nutrients like nitrogen and phosphorous to water chestnut plants. Utilize dead vegetation, fish waste, and other organic inputs to add organic matter to the bed of water chestnut. Ensure sufficient dissolved oxygen, temperature, and pH to maintain good water quality. Aeration or water exchange may be necessary, with regular monitoring.

6. Harvesting and Marketing

Depending on the market need and the growth rate of fish, fish can be harvested. To reduce stress and injury to fish, use the proper fishing equipment and handling methods. Water chestnut is usually ready for harvest after 120 to 150 days (in the months of October to

November). Collect ripe water chestnut fruits using the proper harvesting tools or by hand. To ensure product quality, proper post-harvest handling and storage are crucial. Create marketing channels to promote the sale of both fish and water chestnut products in the neighbourhood or other marketplaces.

Benefits and the Opportunities

1. The Versatile Water Chestnut

Water chestnut provides several kinds of advantages. By oxygenating the water, improving water quality and providing a habitat for many aquatic animals, water chestnut plants contribute significantly to ecosystem services. Fish benefit from water chestnut's shade and shelter, which reduces water temperature changes and algae growth. The combined farming method also diversifies sources of income, enhances farm production, and optimizes the use of land and water.

2. Synergistic Benefits with Fish Farming

The symbiotic relationship that results from combining fish farming and water chestnut farming increases production and profitability. By consuming aquatic plants that compete with water chestnuts for nutrients, fish like tilapia or carp help to naturally reduce weed growth. The water is enriched and the water chestnut plants are nourished by the fish faeces, which also works as an organic fertilizer. This integration encourages environment friendly agricultural methods while improving production and lowering the demand for chemical inputs.

3. Nutritional Security and Market Potential

Aquaculture systems' water chestnut farming enhances food security. The nutrient-rich kernels, which provide ample amounts of vitamin B, minerals such as calcium (Ca), Iron (Fe), Zinc (Zn) and Potassium (K) as well as dietary fiber, serve as an additional source of nourishment. Due to their culinary diversity and use in both traditional recipes and cutting-edge food items, water chestnuts are also in high demand, offering growers profitable marketing prospects.

4. Water Conservation and Environmental Sustainability

Cultivating water chestnuts promotes environmental sustainability and water conservation. Water chestnuts aid in reducing eutrophication and water pollution by absorbing excess nutrients from the water. Water chestnut production encourages ecologically friendly aquaculture practices and contributes to the overall health of aquatic ecosystems by decreasing nutrient runoff and the demand for synthetic fertilizers.

5. Rural Employment and Livelihood Enhancement

Water chestnut farming in aquaculture systems has the potential to improve rural livelihoods and create opportunities. Introducing water chestnuts into fish farming provides farmers with an additional source of income, enhancing their socioeconomic well-being and resilience. The expansion of sectors associated with water chestnuts, such as processing and value addition, may also benefit the regional economy.

6. Government Support and Research Initiatives

Recognizing the potential of water chestnuts in aquaculture, the government has been actively assisting growers through various programs and projects. To encourage the production of water chestnuts and their integration into aquaculture systems, these activities include providing technical assistance, financial support, and research and development initiatives.

Challenges

There are a few challenges that farmers may face when implementing integrated farming of fish with water chestnut. These challenges include:

- 1) **Initial investment:** Compared to conventional agricultural practices, integrated farming may need a larger initial investment. This is due to the fact that farmers must buy equipment, water chestnut plants, and fish. However, integrated farming's long-term advantages might make up for the initial cost.
- 2) **Water quality:** The health of the fish and water chestnut relies on the pond's water quality. Farmers need to maintain the water quality and, if required, take action to enhance it. This may include adding filtration or aeration equipment in the pond.
- 3) **Diseases and pests:** Both fish and water chestnuts are prone to various infections and

pests. Farmers must be aware of these dangers and take precautions to avoid them. This may include applying pesticides or other pest control techniques.

- 4) **Marketing:** Water chestnut and fish might be difficult to market. Farmers must find consumers for their goods and guarantee that they are being paid fairly. A start of contacts with wholesalers or merchants may be necessary for this.

Conclusion

In conclusion, combined fish and water chestnut farming represents a potential and sustainable farming method. Farmers can optimize resources, ensure food security, and generate profits through these integrated practices. However, successful implementation requires expert guidance, water quality monitoring, and proper management techniques.

Aquaculture systems can greatly benefit from the flexibility, nutritional value, and positive environmental effects of water chestnut farming. Adopting this innovative approach has the potential to boost the aquaculture industry, improve rural livelihoods, and promote environmental sustainability and food security. The future holds immense potential for a healthy and profitable agricultural environment as individuals invest in and study water chestnut aquaculture.

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FOSTERING HOPE THROUGH HOOVES: ENRICHING LIVES WITH SUSTAINABLE CATTLE-CENTRIC FARMING FOR RURAL PROGRESS, WOMEN'S EMPOWERMENT, AND LIVELIHOOD ENHANCEMENT

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The cattle enterprise holds immense significance for rural India, playing a vital role in the socioeconomic fabric of the nation's countryside. With a rich history deeply interwoven with agricultural traditions, cattle farming offers a multifaceted array of benefits to rural communities. Beyond serving as a source of milk and other dairy products, cattle provide essential draught power for ploughing fields and transporting goods, particularly in areas lacking mechanization. This symbiotic relationship between cattle and farming extends to organic fertilizer production, contributing to soil fertility and crop yields. Additionally, cattle rearing empowers rural households by diversifying income sources, thereby mitigating financial risks associated with crop failures. The enterprise also acts as a catalyst for employment generation, offering opportunities for skilled and unskilled labour within local communities. The cattle-based farming not only supports rural livelihoods but also strengthens the agricultural backbone of India while preserving cultural traditions and fostering sustainable development.

Transitioning from Tradition to Modernity: The Evolution of Cattle Farming

Cattle farming, often referred to as animal husbandry, is a practice as old as human civilization itself. From the domestication of wild bovines in ancient times to today's intricately managed livestock systems, cattle have journeyed alongside humans, shaping cultures, economies, and landscapes. In modern times, the landscape of cattle-based farming has transformed dramatically. While the fundamental objective of raising cattle for meat and dairy remains, this age-old practice has now been enriched by advancements in genetics, veterinary science, and animal husbandry techniques. Breeding programs have led to improved livestock breeds with higher yields of milk and meat, contributing to enhanced productivity and financial returns for farmers.

Today's cattle-based farming transcends the conventional confines of meat and milk production. A paradigm shift has occurred, acknowledging cattle as active participants in the intricate dance of sustainable agriculture. These animals are increasingly recognized for their integral roles in soil health, crop diversification, and waste management. The nutrient-rich dung they produce serves as a potent organic fertilizer, enriching soil fertility and reducing the need for synthetic chemicals. Moreover, when integrated into crop-livestock systems, cattle facilitate a more harmonious use of land, optimizing resource utilization and promoting biodiversity. At the heart of cattle-based farming lies a symphony of benefits, resonating far beyond the boundaries of traditional agriculture. Income enhancement stands as a cornerstone of this comprehensive approach. The diversification of income streams, a hallmark of modern cattle enterprises, offers a safety net against the volatility of markets and climatic uncertainties. With meat, dairy, leather, and other by-products contributing to revenue, the livelihoods of farming households gain stability, fostering economic resilience in rural communities.

Grazing into Gains: Exploring the Upsides of Cattle-Centric Farming:

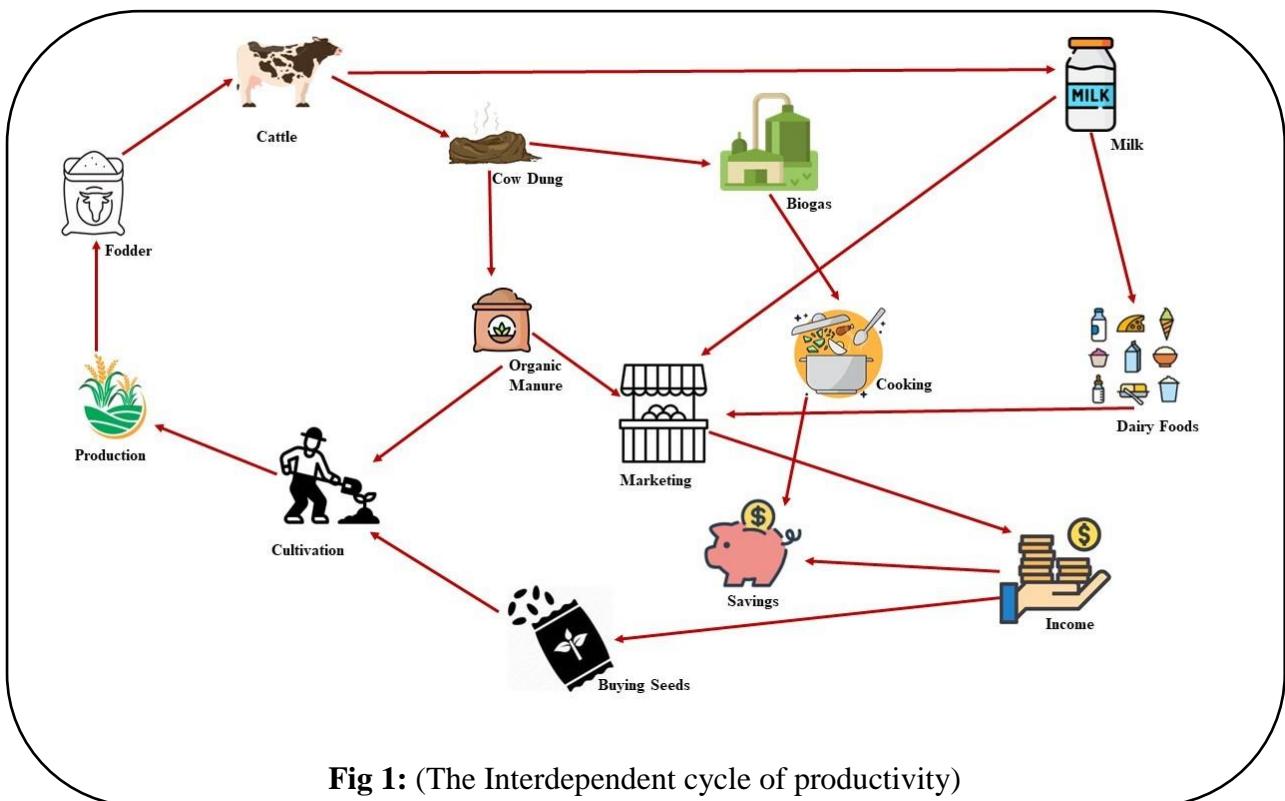


Fig 1: (The Interdependent cycle of productivity)

The provided diagram illustrates the potential benefits of cattle-based farming in establishing a cost-effective agricultural system. By incorporating cattle into the farming

setup, there is an opportunity to create a minimal-budget approach. Cattle provide valuable resources such as cow dung and urine, which can be harnessed to produce a substantial quantity of organic fertilizers without incurring additional costs. The utilization of these organic fertilizers can significantly enhance the quality and yield of cultivation, resulting in fresh and robust agricultural output. Moreover, the surplus produce can serve as fodder for the cattle, thus creating a cyclical resource loop that contributes to a self-sustaining farming system with minimal financial input. Furthermore, the dairy aspect of cattle farming offers an additional avenue for income generation. Milk and various dairy products obtained from cows can be effectively marketed, contributing to a diversified income stream. Beyond dairy, the utilization of cow dung can yield slurry, a resource that can be utilized for biogas production. This renewable energy source not only has environmental benefits but also reduces reliance on conventional sources of energy such as LPG, resulting in cost savings.

Ultimately, a cattle-based farming approach, when efficiently managed, has the potential to yield an enhanced income while requiring minimal initial investment. By optimizing the utilization of available resources and creating interdependent cycles of productivity, this method showcases the viability of sustainable and economically advantageous agricultural practices.

Bovine-Derived Components and Their Diverse Applications

Components	Uses	Outcomes
Cow dung and Urine	Can be used to make organic manures also used as cooking fuel	Potential income from selling cow dung as fuel and organic manure
Milk	Can be sell to market and can be used to make some dairy products	Income from milk sales; potential earnings from dairy product manufacturing
Organic Manure	Can be used in cultivation field for better production	Income from selling organic manure
Slurry	Slurry can be used in bio-gas plant for bio-gas production	Potential savings from bio-gas production
Dairy products (Curd, Ghee etc.)	Can be used to make Panchagavya and some other bio-potions.	Income from selling dairy products, panchgavya and other bio-potions
Cattle	Can be used for cultivating the field	Potential earnings from agricultural productions
Cattle Sperm	Can be used for artificial insemination	Income from providing artificial insemination services

Table 1: Diverse applications of different components

Empowering Rural Women

Cattle-based farming holds significant potential to empower rural women, offering them a pathway to economic independence, enhanced decision-making roles, and increased social status. Historically marginalized in many agricultural contexts, women often find themselves excluded from income-generating opportunities. However, cattle enterprises create avenues for their active participation. Women can engage in various aspects of cattle management, from animal care and feeding to milk processing and value-added product creation. This involvement not only contributes to household income but also allows women to develop new skills, boosting their confidence and self-esteem. As cattle-based farming diversifies income streams, it provides a buffer against the risks posed by traditional crop-centric practices, thus reducing vulnerability. Moreover, this shift challenges traditional gender roles, empowering women to play integral roles in decision-making processes, both within the household and the community. By championing gender equality, fostering economic agency, and promoting skill development, cattle-based farming acts as a catalyst for transforming the role of rural women, paving the way for a more inclusive and progressive society.

Encountering Hurdles in Embracing Cattle-Centric Agriculture

There are also some challenges on which we need to be concerned while adopting this. They are,

- 1. Knowledge and Skill Gap:** The transformation from traditional farming to modern cattle-based practices demands a significant shift in knowledge and skills. Farmers need to be trained in areas such as animal husbandry, breed selection, healthcare management, and waste utilization. Bridging this knowledge gap can be time-consuming and resource-intensive, requiring investment in education and training programs.
- 2. Infrastructure and Resources:** Establishing proper infrastructure for cattle management, including shelters, feeding systems, and waste management facilities, can be a significant challenge, especially in resource-constrained rural areas. Adequate resources for procuring quality breeds, nutritious fodder, and veterinary care are essential for the success of cattle-based farming.
- 3. Financial Investment:** The initial investment required for setting up cattle-based enterprises can be substantial. Farmers may need to secure loans or financial support

to acquire livestock, construct infrastructure, and cover operational costs until the enterprise becomes self-sustaining. Access to affordable credit and financing options is crucial to overcome this challenge.

- 4. Disease Management:** Livestock diseases can quickly spread and lead to significant losses. Implementing robust disease prevention and management strategies, including vaccination programs and biosecurity measures, is crucial to safeguard cattle health and productivity.

Conclusion

In essence, cattle-based farming embodies a holistic approach to bolstering income and rural advancement, intertwining tradition and innovation. Beyond its historical roles, it now thrives as a dynamic force in sustainable agriculture, enriching rural economies through diverse income streams that enhance financial resilience while also breaking gender barriers and empowering women. This paradigm shift from conventional practices to comprehensive systems presents manifold advantages, yet it isn't devoid of challenges. Bridging knowledge gaps, creating essential infrastructure, securing financial investments, and managing livestock health are pivotal to ensuring the viability of cattle-based farming. Collaboration among diverse stakeholders is pivotal to extend necessary support and training, thereby harmonizing tradition with modernity to cultivate not only economic prosperity but also environmental sustainability, gender parity, and societal progress across rural landscapes.

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DISINVESTMENT POLICY: A SOLUTION TO PUBLIC SECTOR ENTERPRISES IN INDIA

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India's disinvestment policy has been a significant component of its economic reform agenda aimed at promoting efficiency, reducing fiscal burden, and encouraging private sector participation in key industries. The Government of India had adopted the policy of disinvestment back in 1991 after the enactment of the New Industrial Policy mainly due to poor performance of public sector enterprises for several past years. India had experienced huge losses in public enterprises, heavy foreign assistance, adverse foreign trade, high budget deficit etc., all of these unfavourable conditions forced the Government to take some serious economic decision to address the various interlinked issues. The policy of disinvestment of public enterprises is one of them (Singh, 2020).

In some cases, disinvestment may be done to privatise assets. However, not all disinvestment is privatisation. Some of the benefits of disinvestment are that it can be helpful in the long-term growth of the country; it allows the Government and even the company to reduce debt. Disinvestment allows a larger share of PSU ownership in the open market, which in turn allows for the development of a strong capital market in India.

The Government, whenever it so desires, may sell a whole enterprise, or a majority stake in it, to private investors. In such cases, it is known as privatisation, in which the resulting ownership and control of the organisation does not rest with the Government. The Government usually avoids doing this. The Government mostly retains more than half of the stake in the public-sector enterprise so that the control remains in its hands. But when it doesn't, then the ownership is transferred to the private sector, which results in privatisation. It is also known as majority disinvestment or complete privatisation wherein 100 per cent control goes to the private sector.

Objectives of Disinvestment

1. To reduce the financial burden of the sick, loss-making PSU's on the Government
2. To improve public finances
3. To introduce competition and market discipline
4. To fund growth, social sector welfare
5. To encourage a wider share of ownership

Different Approaches, Types and Methods to Disinvestment

A. There are primarily three different approaches to disinvestments (from the sellers' i.e. Government perspective)

1. **Minority Disinvestment:** A minority disinvestment is one such that, at the end of it, the Government retains a majority stake in the company, typically greater than 51 per cent, thus ensuring management control.
2. **Majority Disinvestment:** A majority disinvestment is one in which the Government, post disinvestment, retains a minority stake in the company i.e. it sells off a majority stake.
3. **Complete Privatisation:** Complete privatisation is a form of majority disinvestment where in 100 per cent control of the company is passed on to a buyer.

B. Different Types of Disinvestment

1. **Token Disinvestment:** The process of disinvestment started in India with great caution, rather than the radical process of disinvestment, the Government aimed for a gradual process of disinvestment. The process started with political caution and the type of disinvestment that the Government initiated is known as the 'Token Disinvestment'.
2. **Strategic Disinvestment:** Under the strategic disinvestment, the Government sells a majority stake (minimum 51%) in the public-sector company to the private sector. Therefore, as the majority of the shares would go into the hands of these

specialized private players, they will be able to take all the major decisions concerning the business operations and can bring major changes in its functioning.

C. Methods of Disinvestment

- **Initial Public Offering (IPO)** - Initial Public Offering is the event when a company issues its share in the market for the first time. In an IPO the investors can buy the securities directly from the issuing company.
- **Further Public Offering (FPO)** - Further Public Offering is also called follow-up public offering, it is when a listed company (that has already issued its shares through an IPO) issues additional shares after an IPO. Follow-on offerings are also known as secondary offerings.
- **Offer for Sale (OFS)** - Through OFS, shares are auctioned on the platform provided by the Stock Exchange.
- **Qualified Institutional Placement (QIP)** - The QIP is also a type of private placement through which companies' issues equity shares, debentures, or other types of securities to the Qualified Institutional Buyers (QIB). The QIBs are the investors who are deemed to have the required financial knowledge and are legally recognizable by the securities market regulators.
- **Exchange Traded Fund** - Disinvestment through ETF route allows the simultaneous sale of the Government's stake in various Central Public Sector Enterprises (CPSEs) across diverse sectors through a single offering. It provides a mechanism for the Government to monetize its shareholding in those CPSEs, which form part of the ETF basket.

Regulation of Divestment in India

➤ **Department of Investment and Public Asset Management (DIPAM)-2016**

Main functions involves: Management of Central Government investments in equity including disinvestment in CPSUs. Sale of Central Government equity through- Offer for Sale (OFS), Initial Public Offer (IPO), Exchange-traded Fund (ETF), or private placement. Strategic disinvestment- sale of 50 per cent or more of GOI shareholding in identified CPSEs, along with transfer of management control. Capital Management

of CPSUs- bonus shares, dividends, buyback, etc. Advising Govt. in matters of financial restructuring of the CPSES and for attracting investment in CPSEs through capital market. Public Asset Management.

➤ **Department of Public Enterprises (DPE)-1990**

It is largely engaged in coordination of matters of general policy affecting all Public-Sector Enterprises (PSEs).Restructuring or closure of PSEs including the mechanisms. Rendering advice relating to revival.Counselling, training and rehabilitation of employees in CPSEs under Voluntary Retirement Scheme. Categorisation of CPSEs including conferring 'Ratna' status, among others.

Table 1: Recent disinvestment activity of Public Sector Undertakings FY (2021-22)

Name of the CPSEs	% of GoI's Shares Disinvested	Method of Disinvestment	Receipts (Rs. Crores)	GoI's shareholding Post Disinvestment
Hindustan Aeronautics Ltd.	14.82	OFS	4924.23	75.15
Bharat Dynamics Ltd.	12.82	OFS	771.46	74.93
Mazagon dock Shipbuilders Ltd	15.17	IPO	442.79	84.83
Indian Railway Catering and Tourism Corporation Ltd	20.03	OFS	4473.92	67.4
Steel Authority of India Ltd.	10	OFS	2737.56	65
Indian Railway Finance Corporation Ltd.	4.55	IPO	1541.37	86.36
Rail Tel Corporation India Ltd.	27.16	IPO	817.60	72.84
Ircon International Ltd.	16	OFS	676.28	73.18
Rail Vikas Nigam Ltd.	9.63	OFS	542.69	78.2

Source: DIPAM, Government of India.

Table 1. Shows recent disinvestment areas of PSUs. Where Government announced highest disinvestment in Rail Tel Corporation India Ltd. (27.16%) followed by Indian Railway Catering and Tourism Corporation Ltd. (20.03%) and Government able to receive

817.6 crores and 4473.92 respectively. Because this type of disinvestment providing way to efficiency in the public sector and gradually leading to growth of public enterprises.

Advantages of Disinvestment

➤ For the Government

Raising valuable resources for the Government, which could be used to bridge the fiscal deficit for one, but also for various developmental projects in key areas such as infrastructure. Apart from generating a one-time sale amount, many of these stake sales would also result in annual revenues for the Government, as has been shown in the past. The Government can focus more on core activities such as infrastructure, defences, education, healthcare, and law and order. A leaner government with reduction in the number of ministries and bureaucrats.

➤ For the Markets and Economy

Brings about greater efficiencies for the economy and markets as a whole.

➤ For the Taxpayers

Letting go of these assets is best in the long-term interest of the taxpayers as the current yield on these investments is abysmally low. Even if the funds from the sale are not utilised for bridging fiscal deficit, a much better utilisation of these 'stuck' funds would be into critical sectors such as healthcare, education and infrastructure. Unlocking of shareholder (in this case the citizens of India) value.

➤ For the Employees

Monetary gains through ESOPs and preferential issue of shares pay rises, as has been seen in past divestments Greater opportunities and avenues for career growth- further employment generation.

➤ For the PSUs

Allow PSU to raise capital to fund their expansion plans and improve resource allocation in the economy. Greater autonomy leading to higher efficiencies.

Challenges of Disinvestment

- The Sale of profit-making and dividend-paying PSUs would result in the loss of regular income to the Government. It has become just a resource raising exercise by the Government. There is no emphasis on reforming PSUs.
- The valuation of shares has been affected by the Government's decision not to reduce government holdings below 51 percent. With the continuing majority ownership of the Government, the public enterprises would continue to operate with the earlier culture of inefficiency.
- The process of disinvestment is suffering from bureaucratic control. Almost all processes starting from conception to the selection of bidders are suffering due to it. Moreover, bureaucrats are reluctant to take timely decisions in the fear of prosecution after retirement.
- Some experts say Strategic Disinvestment of Oil PSUs as a threat to National Security. Oil is a strategic natural resource and possible ownership in the foreign hand is not consistent with our Strategic goals. For example, disinvesting Bharat Petroleum Corporation Limited (BPCL).
- Loss-making units do not attract investment so easily. It depends upon the perception of investors about the PSU being offered. This perception becomes more important in the case of strategic sales, where the amount of investment is very high.
- Complete Privatization may result in public monopolies becoming private monopolies, which would then exploit their position to increase costs of various services and earn higher profit.
- Using funds from disinvestment to bridge, the fiscal deficit is an unhealthy and short-term practice. It is said that it is the equivalent of selling 'family silver' to meet short-term monetary requirements.

Conclusion

Disinvestment is good for a country's economy as it provides revenue for the Government, increases operating and financial performance of enterprises and restructure those units, which are continuously loss-making enterprises. Disinvestment can lead to

increase the efficiency through better utilization of resources but riskless privatization may not provide the ultimate solution for longer period. India's disinvestment policy has been instrumental in promoting efficiency, encouraging private sector participation, and generating revenue for developmental purposes. While facing challenges and criticisms, the policy continues to be an important tool in India's economic reform agenda, facilitating economic growth and restructuring of key sectors.

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MULTIPLE FRAME SURVEYS FOR AGRICULTURAL STATISTICS

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In our nation, the Agriculture Enumerative Survey (AES) is carried out every five years by the Agriculture Division of Statistics. Estimates for crops, animals, and other products are produced for all states by the AES, a multi-purpose survey based on an area sample. The survey has frequently had issues with the sample size allotted to smaller provinces being insufficient to generate accurate provincial estimates.

When it is impossible to secure a single sampling frame that covers the entire population or when two or more affordable sampling frames are available from various sources and cover the entire population, multiple frames (MF) are preferred. The usage of several frames is often necessary even if it is sometimes possible to employ a unique frame, but doing so may be quite expensive.

Even if using a unique frame is occasionally conceivable, doing so may be highly expensive. As a result, it may be more cost-effective to use numerous frames to cover the entire population. Utilizing MF surveys is mostly done so in order to save costs while keeping estimating efficiency that is nearly on par with single frame surveys.

In a multiple-frame survey, probability samples are drawn independently from the frames A_1, A_2, \dots, A_Q ; $Q \geq 2$ respectively. The union of the Q frames is assumed to cover the finite population of interest U . Then the universe may be divided into $2^Q - 1$ mutually exclusive domain. Instead of using the standard single frame of units from the target population, a multiple frame (MF) survey combines two or more sampling frames. If independent probability samples are chosen from different frames, each frame may or may not be full, but the union is presumed to be complete and the information from the samples is used to estimate quantities of interest. Incomplete frames are less expensive to sample than

entire frames, provided they are available.

In order to do this, area and one or more list frames are typically used together for agricultural purposes.

Example: In Agricultural sector:

- Use of several lists frames(List of food crop farmers, list of cash crop farmers)
- Use of area and list frames

Advantages of Multiple Frame surveys

- Highlight each frame's advantages while minimizing its shortcomings.
- When an area frame and a list frame are combined, numerous frames enable the quick and inexpensive generation of lists of agricultural holdings solely in the selected areas rather than across the entire nation. It is possible to measure and control variability.
- Enable the study of special or rare products.

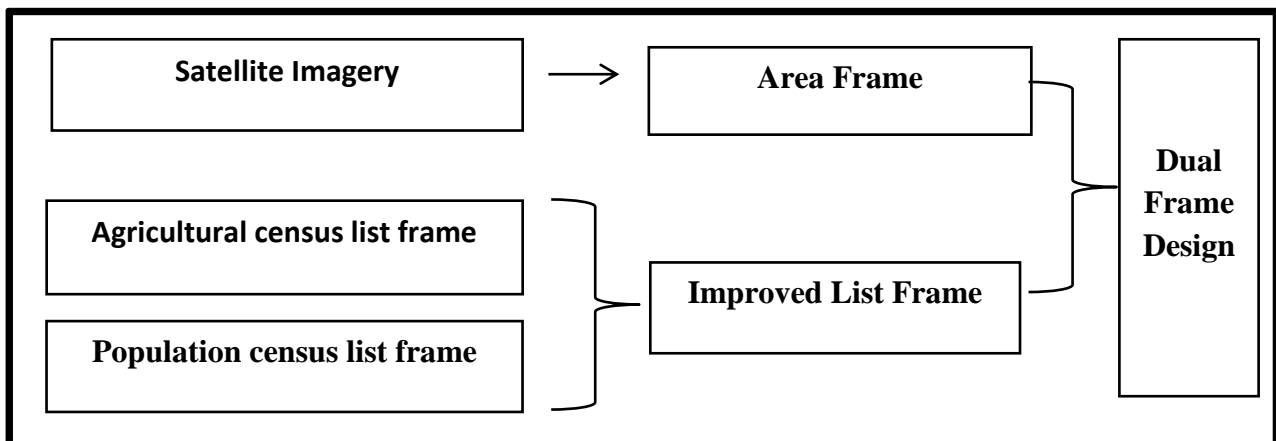


Fig1: Application of Multiple Frame Survey in Agricultural sector

The concept of the multiple frame approach was initially developed theoretically by Hartley in 1962. Later, Cochran (1965), Lund (1968), Fuller and Burmeister (1972), Hartley (1974), Skinner (1991), Mecatti (2007), Rao and Wu (2010), and other authors contributed significantly to this study.

Different Multiple Frame Estimators

- Hartley and the screening estimator (Hartley (1962, 1974))
- The Fuller-Burmeister estimator (Fuller and Burmeister (1972))

- The ranking ratio estimator (Skinner (1991))
- Pseudo-maximum likelihood (PML) estimator (Skinner and Rao (1996))
- Single frame multiplicity estimators (Mecatti (2007))
- Pseudo-Empirical Likelihood (PEL) estimator (Rao and Wu (2010))
- Generalized modified Horvitz-Thompson (GMHT) estimator (Singh and Mecatti (2011))

Conclusion

In conclusion, it is felt that multiple frame testing has unquestionably been worthwhile after reviewing various research based on MFS. We will be able to greatly enhance our estimates in next surveys, just as other nations that have previously attained improved estimators, by applying the MFS approach to the Agricultural Surveys of India. The Multiple Frame minimizes the flaws of each frame while maximizing their positives. In the context of Multiple Frame, a number of estimates with varying levels of complexity are produced, although it is advised that the estimator be selected on the basis of simplicity. The easiest estimators to comprehend and use in real life are screening estimators (Hartley (1962, 1974)). Additionally, the sampling size to be defined should minimize the variance subject while allocating it to the region and list frame.

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ORGANIC WAYS FOR LONG TERM SEED PRESERVATION

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Seed is one of the key inputs for agriculture. Use of quality seeds assures good germination and vigorous seedling growth by reducing the seedling mortality and ensuring the high plant stand establishment. Harvesting and keeping the seeds inside storage for sowing in next season is a common and traditional farmers' practice. In general, seed quality deteriorates during the storage. During seed storage, a number of physiological and biochemical changes take place. Several experts have noted that the quality of seeds degrades over time as a result of environmental factors such as air conditions, pest and disease attacks, and storage-related irradiation. Degradation of seed quality is directly reflected in seed germination and on-field plant performance. To overcome the seed deterioration in storage and to preserve the seeds for long period by maintain its quality, it is therefore needed to use different technologies viz. use of proper seed packaging materials, seed invigoration with powdered materials, storage under controlled environment, regular monitoring etc. Powdered materials of various compositions (chemicals, crude plant materials, pharmaceutical powders, etc.) are useful in treating seed during storage as it helps to check seed quality deterioration and maintain seed longevity (Bhattacharya *et al.*, 2015; Guha *et al.*, 2012). Different storage containers can also play a key role in effective preservation of seeds. In today's climate change scenario, it is wise not to use of chemicals, synthetic and non-degradable materials for any farming activity. Therefore, organic ways of seed preservation can help the farmers to store the seeds and cultivate the crops in eco-friendly manner.

Organic Ways of Seed Preservation

Seeds are maintained in a natural, chemical-free environment. Organic materials are essential for seed preservation because they keep seeds alive, healthy, and chemical-free.

Utilizing organic materials supports environmentally beneficial and sustainable practises, which are good for the environment and the health of the seeds.

Functions of Organic Compounds in Seed Preservation

The main functions of organic compounds in seed preservation are as follows:

- Organic materials are preserved without the use of artificial chemicals, insecticides, or herbicides. By employing organic materials, contaminants can be prevented from potentially contaminating the seeds and affecting their quality and germination.
- Compared to non-organic alternatives, organic materials biodegrade more quickly and have less influence on the environment. Utilizing organic materials promotes sustainable gardening and seed preservation techniques while reducing waste.
- Organic substances with natural insect-repellent characteristics include neem leaf powder, garlic, citrus peels etc which safeguard the seeds during storage into seed preservation.
- Natural substances with the ability to absorb moisture include clay, silica gel, and grains of rice. By preventing mould growth or seed degeneration brought on by high humidity, these compounds aid in maintaining proper moisture levels during seed storage.
- Air may circulate inside seed storage containers made of organic materials like fabric, paper, or straw. For seeds to remain viable and to avoid suffocating, proper air circulation is crucial.
- The stored seeds receive nutrition from organic elements like compost or coconut coir. Nutrient-rich materials can help seeds during storage, resulting in better germination and early growth following planting.
- Biodegradable seed-saving envelopes, pots, or containers from of organic materials are made and placed straight into the ground, eliminating waste and minimizing transplant shock.
- Many organic components employed in seed preservation have been a part of conventional and tried-and-true procedures in many different civilizations. Over many generations, these techniques have been improved. Heirloom and conventional seed varieties are frequently saved as part of organic seed preservation. Organic materials help the retention of distinctive genetic features and improve total agricultural biodiversity by preserving a variety of seed stocks.

- The storage of seeds using organic materials is consistent with sustainable agricultural and gardening practices. It promotes ecological resilience and self-sufficiency while encouraging appropriate land stewardship.
- Organic materials can be used in sustainable agriculture since they are consistent with its guiding principles. Organic seed preservation promotes a more symmetrical and durable farming system by utilizing renewable and natural resources.
- Organic seed preservation promotes the use of materials that are readily available locally and that are sustainable. As a result, gardening and seed preservation procedures may have a less carbon footprint.
- Compost and coconut coir are two examples of organic compounds that support soil health. They also improve soil fertility. When seeds are kept in or near nutrient-rich materials, their chances of thriving when planted increase, producing plants that are stronger and healthier.
- The preservation of organic seeds frequently entails age-old methods that have been handed down through the generations. Adopting these methods contributes to the preservation of agricultural expertise and cultural legacy.
- Local communities can maintain control over their seed supply and lessen reliance on commercially manufactured hybrid seeds by encouraging the preservation of organic seeds. This empowerment promotes food independence and increases a community's capacity for resilience.

Organic Materials- Some Examples

Organic materials can be used to preserve seeds in a way that supports environmental sustainability and environmental health while simultaneously preserving seed quality and viability. Farmers may support a more wholesome and durable food system for future generations by adopting organic practices. To ensure that no dangerous chemicals or synthetic materials come into contact with the seeds when preserving them using organic methods, it is wise to utilize organic and natural materials. Here are some examples of common organic raw ingredients for seed preservation:

- **Organic cotton cloth or paper:** To create seed bags or envelopes, organic cotton cloth or paper can be used. There should be no synthetic chemicals or pesticides in organic cotton or paper. Bandanas made of organic cloth can be used as a breathable container to wrap and store seeds.

- **Organic silica gel:** It can be used as a desiccant to absorb moisture and stop the growth of mould while storing seeds.
- **Organic rice grains:** Organic rice grains can be used as a natural desiccant to absorb extra moisture in seed storage containers in place of conventional silica gel.
- **Organic clay:** When making seed balls, organic clay or terra cotta can be utilized. Clay, compost, and water are combined to cover the seeds, protecting and nourishing them up until planting. Seed saucers made of organic clay are used to store and protect seeds.
- **Organic charcoal:** To eliminate odours and guard against contamination, activated charcoal can be applied to seed storage containers. In many places, biochar prepared from controlled pyrolysis can also be used to preserve seeds.
- **Organic sand:** Sand can be used to aid in seed drying and storage for seeds that require a dry environment.
- **Organic plant oils:** Neem oil, garlic-infused oil and other natural plant oils, as well as essential oils, can be used sparingly to keep pests away during seed storage and during planting. One natural insect repellent used in seed storage is **organic citronella oil**.
- **Organic wood shavings:** These are used to store and package seeds as a natural substitute for plastic or other synthetic materials.
- **Organic sawdust:** It can be used as a cover for seeds while they are being stored.
- **Horse gram dust:** Seeds can be stored along with horse gram dust as it helps to absorb excess moisture from seeds (Mathod *et al.*, 2013).
- **Red soil:** Seeds were dried in the shade and preserved after being covered in fine red soil from the community pond or hill. 1 kg of soil is utilized for every 10 kg of seed (Mathod *et al.*, 2013).
- **Plant derived powder:** Seeds can be stored with bitter melon, drumstick seed powder, mint, sweet flag root powder etc (Mathod *et al.*, 2013).
- **Smearing of earthen pot:** Smearing of earthen pot with cow dung slurry is helpful to make the container air-tight for long term storage.
- **Organic citrus peels:** When placed close to seed storage, dried citrus peels can act as a natural insect deterrent.
- **Organic plant-based dyes:** Non-toxic dyes can be used to colour envelopes for storing seeds.

- **Malted organic barley** is a seed inoculant that can help the soil's beneficial microbial population flourish.
- **Organic gourd shells:** These serve as all-natural seed jars for preserving seeds.
- **Organic willow baskets or containers:** These eco-friendly seed storage options promote airflow. Handmade wooden boxes are used for keeping seeds.
- **Organic gourd shells:** These serve as a natural seed jar for preserving seeds.
- **Organic moss or lichen:** It is used to cushion and safeguard seeds while they are being stored.
- **Organic wool felt:** It is used to make seed bags or envelopes for storing seeds. **Organic felted wool pads** can be used to cushion seeds while they are being stored.
- **Organic hessian sacks:** These are used to store bigger quantities of seeds in bulk.
- Biodegradable stoppers for seed storage containers can be made from **organic wine corks**.
- Natural seed storage can be done with **organic bamboo containers** because of their sturdiness and sustainability.
- **Organic banana leaves** are used to make seed balls and envelopes for storing seeds.
- **Organic herbal sachets:** To naturally ward off pests, dried herbs like lavender or rosemary can be scattered near seed storage.
- **Organic wool or cotton pads:** These are used to cushion seeds while they are being stored.
- To tie seed bundles for storage or seed preserving, organic **hay or straw** twine can be used. Seed bundles can be tied using **organic hemp rope**.
- **Organic eucalyptus leaves:** Dried eucalyptus leaves have the ability to protect stored seeds from pests.
- **Organic chitosan** is a naturally occurring material formed from chitin that can be applied to seeds to increase disease resistance.
- **Organic pottery:** Due to its breathability, handmade pottery vessels can be used to store seeds.
- **Organic cattail fluff:** It can be used to protect delicate seeds during storage.
- **Wooden racks** can be used for organized seed storage and exhibition if they are made of organic wood.
- **Handwoven organic seagrass baskets** can be used to store seeds because they are breathable and natural.
- Natural seed storage containers can be made using **organic straw or hay bales**.

- **Ceramic or organic stone tiles** are suitable for use as labels on seed envelopes or storage containers.
- **Organic cinnamon sticks** can serve as a natural insect repellent when placed close to seed storage.
- **Sphagnum moss** made from organic materials is used as a cushion to keep seeds safe while being stored.
- **Organic dried flower petals:** These can be used as embellishments for containers or envelopes for storing seeds.
- **Crushed organic walnut shells** can be used to make natural colour for envelopes for storing seeds.
- **Organic herbal smoke:** In regions where seeds are stored, certain herbal smokes like mint, basil, lavender, chives, rosemary etc. can serve as free-acting insect deterrents.

Pre-requisites for Organic Ways of Seed Preservation

- Any material used should be eco-friendly and chemical-free.
- It is essential to use materials free of pesticides, herbicides, and other potentially dangerous substances as they can impair the health and viability of seeds.
- Maintaining the integrity of the seeds and promoting sustainable gardening techniques should be guaranteed by organic seed storage.
- The materials should be user friendly and compatible with the seeds.
- These materials must complement and fulfil the purpose of seed storage.
- These materials should not show any harm to the users, seeds and others.
- These materials should be fresh, uncontaminated, pure and should not show undesirable impacts on seed quality and should not interfere with cultivation practices.

Conclusion

By supporting sustainable agriculture, fostering biodiversity, and reducing environmental harm, organic materials are essential for seed preservation. However, these organic materials are less explored and remained mostly as ITK (indigenous technological knowledge) practices. Many of such ways lack scientific elucidation. Therefore, researches and scientific explorations on these organic ways/ materials are highly required to confirm their efficacy for preservation of different kinds of seeds. These materials should also be utilized adequately and demonstration, awareness etc. can be made through extension

workers because we can contribute to a healthier, more durable food system and a more sustainable future for agriculture by using organic seed preservation techniques.

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REDEFINING AGRICULTURAL EXTENSION: A PLURALISTIC APPROACH

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In the evolving agricultural landscape, it is essential to shift away from the conventional practice of centralized knowledge sharing and instead embrace a pluralistic approach to extension. This approach involves engaging various stakeholders, such as community groups and technology companies, to develop comprehensive, localized, and innovative solutions. However, the successful implementation of this approach requires careful coordination, representation, and quality control. By embracing pluralistic models, agriculture can address its complex challenges and create a sustainable, inclusive, and productive future for all stakeholders.

The agricultural sector is undergoing rapid changes due to various factors, such as evolving socio-economic dynamics, diverse environmental conditions, and expanding global markets. This has created a need for a more comprehensive approach to disseminating farming knowledge and skills. Additionally, the integration of technology in farming, the growing emphasis on sustainable practices, and the demand for diverse crop varieties and farming techniques in the global food market have further complicated the traditional approach to agriculture. This traditional approach, which relies on a one-sided dissemination of knowledge, is often inadequate for addressing the diverse and intricate demands of modern agriculture. Moreover, as the challenges of food security, climate change, and economic sustainability intersect in the agricultural sector, there is an urgent need to reconsider our methods of disseminating agricultural knowledge. Therefore, it is increasingly important to shift towards a pluralistic agricultural extension model that values and combines different perspectives and expertise.

Stakeholders in Pluralistic Agricultural Extension

The pluralistic agricultural extension approach involves expanding perspectives by involving multiple stakeholders. Instead of relying on a single source for sharing knowledge, it emphasizes the involvement of various stakeholders, including local community groups, private sector organizations, non-governmental organizations, and even digital information platforms.

- **Governmental Bodies:** Traditional providers of agricultural services, responsible for policy-making and regulation
- **Non-governmental organizations (NGOs)** They address gaps in services, emphasizing grassroots knowledge and sustainable practices.
- **Private Sector:** Companies that introduce farmers to new technologies and practices related to their products
- **Farmers' Associations and Cooperatives:** These are groups that represent the concerns and needs of the farming community.
- **Research institutions and universities** are pioneers of evidence-based practices and new agricultural techniques.
- **International Development Organizations:** Entities like the Food and Agriculture Organization (FAO) offer support, best practices, and funding to developing nations.
- **Media and Technology Platforms:** Digital entities disseminate knowledge through various online mediums.
- **Local Community Leaders:** Guides based on traditional wisdom and community consensus
- **Consultants and independent experts:** specialists offering customized solutions to farming challenges
- **Financial Institutions:** Banks Influencing Farming Decisions Through Financial Products

The Pluralistic Model Offers Multiple Advantages

- **Extensive Knowledge Database:** By involving a variety of contributors, the knowledge database becomes vast, incorporating traditional farming knowledge, contemporary scientific research, market-driven perspectives, and innovative solutions.

- **Customized Approaches:** Recognizing that each region may face distinct challenges and opportunities, a collaborative approach ensures that solutions are tailored to the specific local circumstances.
- **Networking and Cooperation:** Collaboration among various stakeholders establishes a supportive network, enhancing the resilience of the farming community and fostering innovative ideas.

Challenges of Pluralistic Extension System

- **Coordination and Overlapping Responsibilities:** When multiple stakeholders with different goals come together, conflicts can arise, efforts may be duplicated, and roles may not be clearly defined. This can result in the inefficient use of resources and inconsistent guidance for farmers.
- **Quality Assurance and Information Overload:** Having multiple sources of information makes it challenging to maintain consistent quality. Farmers may encounter misinformation or feel overwhelmed by the abundance of advice, making it difficult to determine the best practices or courses of action.
- **Equity Concerns and Economic Biases:** There is a risk that larger entities may overshadow smaller, grassroots participants, leading to an imbalance in representation. Moreover, profit-driven motives, particularly from the private sector, can influence the advice given to farmers, potentially compromising sustainable and holistic agricultural practices.

Conclusion

The shift towards a pluralistic agricultural extension system emphasizes the dynamic and intricate nature of contemporary agriculture. This approach aims to include a variety of stakeholders in order to provide a more comprehensive perspective that integrates traditional knowledge with contemporary science and local insights with global trends. While this system offers numerous benefits, such as a wealth of knowledge and region-specific solutions, it also presents challenges. Issues such as defining roles, ensuring information quality, and promoting equal representation are crucial. To navigate this shift, it is important for all stakeholders to collaborate and establish clear protocols and communication channels. The ultimate goal is to create a robust and flexible agricultural sector that benefits both

farmers and the global community. As we progress, our strategies must evolve to meet the demands of the present while also establishing a strong foundation for the future.

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Alternaria sessile- AN UNDERUTILIZED LEAFY VEGETABLE CROP

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The *Alternaria sessilie*, ponnaganiaaku (in Telugu), Honnagone in Kannada, Mukunuwenna (in Sinhala), sessile joyweed, and dwarf copperleaf are some of the common names for the aquatic plant known as Ponnanganni. Particularly in Sri Lanka and certain other Asian nations, it is consumed as a vegetable. The plant naturally grows in the wild, but it is also grown for food, herbal medicines, as an aesthetic plant (red variation, as a hedging plant), in the aquarium industry (despite the fact it only grows submerged for brief periods), and as poultry feed.

Botanical Description

Botanical Name: *Alternantherasessilis* (L.)

Synonyms: *Gomphrenasessilis* L.

Common Name: Sessile Joyweed, Jal Jambvo

Family: Amaranthaceae

Plant Type: Herb

Habit: A 10–30 cm tall, prostrate herb that roots at the lower nodes.

Stem: Simple or branching, yellowish-green, deep-green or reddish-purple, glossy, quadrangular at first, terete when old, with longitudinal row of hairs on two opposed sides as well as with transverse hair lines at nodes, internodes 4–7 cm long

Leaves: Sessile or sub-sessile, opposite, elliptic-oblong, obovate - oblong or oblanceolate, rounded, obtuse or sub-acute at apex, tapering or acute at base, entire along the margins, glabrous or thinly hairy leaves are available.

Inflorescence: Spikes

Flowers: In axillary globose condensed spikes, small, 1.5–2 mm long, whitish or with a pinkish tinge, with 1-celled anthers.

Fruit: Brownish to straw-colored, 2 mm long, obcordate, strongly emarginated, glabrous, and falling off with the perianth tricles. 1-2 mm in diameter, glabrous, and oval seeds. Almost the entire year is when flowers and fruit are in season.

Significance

- People who are poor eat it as a vegetable.
- It is administered to women in postpartum situations in order to stimulate the flow of milk.
- Leaf is applied to spots.

Table 1: Nutritional Content

Content	<i>A.Sessilis</i>
Protein %	16.0
Fat%	3.2
Fibre%	13.4
Calcium%	0.57
Phosphorus %	0.50
Magnesium %	0.64
Potassium %	4.3
Sodium %	0.11
Oxalic acid %	4.7

Medicinal Properties

Eye care

- Ponnangannikeerai, or leaves, are among the greatest treatments for issues relating to the eyes. To treat irritation in the sebaceous glands of the eyelids, fresh leaves are applied in this manner to the lids. Conjunctivitis and chronic eye irritation are also treated by it.

Removes body heat

- The oil that has been extracted from the leaves can be thoroughly massaged into the scalp, left on for about 15 minutes, and then washed out with shampoo.
- This technique maintains the eyes cool while bringing down body heat to a normal level. Repeating the procedure on a regular basis encourages healthy hair growth as well.

Cures Asthma

- Intermittent continuous cough and asthma two tablespoons of ponnanganni juice mixed with one or two garlic cloves should be consumed.

Enhances breast milk

- Consuming cooked ponnangannikeerai and the plant's supple stems benefits breastfeeding moms by enhancing breast milk in addition to preserving liver health.

Food Products from Ponanganikeerai



Kootu for glowing skin



Ponnangani oil for headache and remove to heat from body



Ponnanganidosa for anemia



Ponnangani soup for body pain

Conclusion

Achieving food and nutritional security is hampered by climate change and population expansion. Increased food security and risk reduction can result from the production of a wider variety of food crops. For nutritional security, diverse diets based on a variety of crop species are crucial. The micro, macro, and phytonutrient content of leafy, underutilized vegetables, like ponangani in particular, is notable. These nutrients can greatly improve nutritional security and reduce malnutrition. Because of its low cost, it is therefore important to encourage the intake of this green leafy vegetable, especially among the population's most vulnerable groups. In the future, with this approach, we could fight the malnutrition issues in our nation.

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SEED PROCESSING FOR PROSPERITY: NURTURING AGRICULTURAL GROWTH AND SUSTAINABLE DEVELOPMENT

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Seed processing plays a crucial role in modern agriculture by ensuring the quality, viability, and uniformity of seeds used for crop production. As a fundamental step in the agricultural value chain, seed processing directly impacts crop yield, quality, and overall food security. In the pursuit of global prosperity, the significance of seed processing cannot be underestimated. This article explores the pivotal role of seed processing in promoting agricultural growth, sustainable development, and ultimately, prosperity for nations and communities worldwide.

The Importance of Quality Seeds

Quality seeds serve as the foundation of successful crop production. They contain the genetic potential for optimal yield, disease resistance, and adaptability to changing environmental conditions. However, this potential can only be harnessed if seeds are of high quality and purity. Seed processing is a critical step in achieving these goals. During seed processing, impurities such as debris, weed seeds, and disease-causing pathogens are removed, ensuring that the planting material is free from contaminants that could compromise crop performance. Furthermore, proper seed processing involves techniques like drying and conditioning, which enhance seed germination rates and vigor. This emphasis on quality ensures that farmers are equipped with the best possible start for their crops, setting the stage for prosperous agricultural outcomes.

Uniformity for Enhanced Productivity

Uniformity in seed size, shape, and appearance is another essential outcome of seed processing. Uniform seeds lead to uniform plant emergence, growth, and maturity, simplifying crop management practices. This consistency allows farmers to optimize resource

allocation, as each plant experiences similar conditions, making irrigation, fertilization, and pest control more effective. The result is enhanced productivity, reduced waste, and increased profitability.

Sustainable Agriculture through Seed Processing

Sustainability is a cornerstone of modern agricultural practices. By promoting the use of quality, disease-resistant seeds, seed processing contributes to reduced reliance on chemical inputs, thereby minimizing environmental impact. Disease-resistant seeds reduce the need for pesticides, while optimal germination rates reduce the need for excess water and fertilizers. As a result, seed processing aligns with the principles of sustainable agriculture, preserving natural resources, and mitigating the negative effects of climate change.

Economic Growth and Rural Development

Seed processing also holds the potential to drive economic growth and foster rural development. Access to quality seeds can significantly improve the livelihoods of smallholder farmers, who often lack the resources to experiment with different seed varieties. Improved crop yields and quality translate into higher incomes for farmers, enhancing their purchasing power and driving local economic activities. In this way, seed processing contributes to poverty reduction, food security, and the overall well-being of rural communities.

Technology and Innovation

Advancements in seed processing technology have further amplified its role in promoting prosperity. Automation, artificial intelligence, and data analytics are revolutionizing seed processing facilities, allowing for higher throughput, precision, and quality control. These innovations streamline operations, reduce costs, and ensure that farmers have access to seeds of the highest quality. Moreover, research in seed biotechnology continues to yield genetically enhanced seeds with improved traits, such as drought resistance and nutritional content, further expanding the potential for agricultural prosperity.

Global Collaboration and Knowledge Sharing

In an increasingly interconnected world, the dissemination of knowledge and best practices in seed processing has become more accessible. International organizations, governmental agencies, and agricultural research institutions collaborate to develop and

disseminate cutting-edge seed processing techniques. This global exchange of information empowers farmers with the tools and knowledge they need to maximize their crop yields, adapt to changing conditions, and contribute to their nation's agricultural prosperity.

Conclusion

Seed processing stands as a linchpin in the pursuit of agricultural growth, sustainable development, and overall prosperity. By ensuring seed quality, uniformity, and innovation, seed processing drives economic growth, enhances food security, and fosters rural development. As nations grapple with the challenges posed by a growing global population and environmental uncertainties, investing in seed processing technologies and practices will prove instrumental in shaping a prosperous and sustainable future for all. Through strategic partnerships, research, and implementation, seed processing can continue to be a driving force behind the achievement of agricultural prosperity worldwide.

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THE ROLE OF AQUAPONICS IN INDIAN CONTEXT

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Aquaponics is an innovative crop production technique where two to three crops can be produced by minimizing the land and water resources. It's a promising sector for continuous production of food with the help of combination of RAS and hydroponics farming. India is called a central station of global agriculture. 70 percent population of India are found in rural areas and somehow their livelihood depends on producing crops. In India the most common barrier for crop production is lack of knowledge to access the advanced technology, unskilled manpower, and limited land area with climate condition. To observe the present condition of India after the Covid situation, aquaponics can be the major solution of nontoxic organic crop production. Generally aquaponics system supports to grow fishes with different types of leafy and fruity vegetables. In recent trends, three kinds of aquaponics models are popular in worldwide for their compatibility and production margins.

In Indian climate condition and on the basis of cultivation investment, crop production in aquaponics medium will be beneficial than soil medium. Manually floating raft aquaponics system and nutrient film technique aquaponics system are familiar in India other than media based aquaponics system. Any types of aquaponics system contain fish tank, clarifier tank, and bio filter tank with plant production unit. Fish waste act as an organic fertilizer for production of plant and plant function as a natural bio filter for the medium which extract nitrate from the system and keep fish healthy and stress free. Aquaponics can play the outstanding role in the maximum production of the crops from single unit and could upgrade Indian agri based economy by several ways:

Effective natural resource utilization: Most of the farmer of India are marginal and small farmers and they habitual in land based traditional agro farming. Traditional agro farming needs vast amounts of water and fertile lands for getting maximum production from

production unit. Some parts of India, arid or barren land resources and freshwater scarcity for irrigation is a prime problem. In aquaponics system, water is recycled regularly and fulfill the demand of water to each and every crop components and a single unit infertile land can be manufacture highest yield. To achieve expectable production from the agro based investment, aquaponics would be the great choice.

Nutrient Managements: Aquaponics system follow the close loop system where fish and plant both are grow through maintaining the symbiotic relationship. The integrated nutrients deduct the necessity of chemical fertilizer and produce the organic crops in cost effective and hassle free way.

Multiple crop production: Aquaponics help to turn out a broad range of crops which vary from leafy to fruity vegetables. The divergence of food variety not only secure the food scarcity problems also enhance the quality of life by economical sustainability.

Local crop production: Most of the land of the India experience a prominent physical variations. Aquaponics permit for year round farming in any local areas of Indi. This system can supply enormous production of local food which minimize the transportation cost of import and steady the local food security.

Economic opportunities: Aquaponics can participate to lower the poverty level by economic development through agrobased production. Farmers to common people can earn handsome money by adopt or engage with this system.

Sustainable food production unit: This system is an exceptional role model of sustainable production of food. The waste matter of this system utilize in a scientific way which stunted the environmental impact effortlessly.

Reduction the manpower: Indian agriculture mainly depends on manpower for each and every stage of cultivation namely seeding, trilling, fertilization, harvesting and marketing also. Aquaponics systems can manage the whole systems only fewer labour cost.

Climate Resilience: In India, climate is a major issue for acquiring maximum product from the soil based agri field. Due to unpredictable weather patterns, aquaponics may be the solution for controlled the environment as demand basis and this unique systems can manage the weather related matters for cultivation easily.

Educational and research value: Mainly aquaponics system is a highly developed technology system and this system is a greenhouse of education on hydroponics, fisheries, microbiology, hydrology, physics and civil engineering also. For this specific reason this system could be provide a best opportunities for research and innovation with educational tool to teach students.

Still and all in Indian context, crop production by adopt aquaponics system faces several challenges including:

Primary investment: Installation of aquaponics system demand an upbringing investment at primary stage for infrastructure, major equipment's and training. Most of the farmers of India are small and marginal farmers and they are not familiar with investment in technology based agriculture. So, organizing the training session for the farmers by taking on aquaponics under the govt. scheme and provide loan to initiate the system functionally, would be the solution to spread the popularity of the system.

Markets affirmation: The collected crop from aquaponics system are healthier than traditional agro product. But the aquaponics crops dealing severe confronts in terms of consumer perception, market acceptability and pricing also. Advertising with campaigning and public awareness on organic food consumption through aquaponics system may be help to upgrade the acceptability of aquaponics product.

Energy Dependence: Aquaponics is an energy embraced agro technology. To regulate the system manually, continuous energy for recycling the water, lighting the plant, oxygenation are necessary. In rural or remote areas where power supply is unreliable, it could be create a barrier for expectable product.

Regulation and policies: In favor of aquaponics system, relevant policies need to be developed to carry out and promote this sustainable farming technique comfortably.

Conclusion

In whole world wide aquaponics supposed to be a blessings of agritechnology which can produce the crops against the inadequacy of water for irrigation, infertility of land and application of pesticides with synthetic drugs. In India, aquaponics has the potential for renowned as a sustainable farming system for incessant production of food and can also play a key role in increasing GDP of India in agriculture.

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UNVEILING THE CONTRASTS BETWEEN RURAL TOURISM AND AGRO-TOURISM

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The journey of exploring the countryside has two different and distinct paths i.e., rural tourism and agrotourism. Uncovering the differences between these two types of rural exploration highlights the wide varieties of experiences available to tourists seeking a rural vacation. Rural tourism focuses more on cultural and natural aspect, offers a profound connection with history and heritage. On the other hand, agrotourism combines agricultural activities with tourism. Travellers participate in farming activities and gaining valuable insights in to the farming community. The key contrast between agro tourism and rural tourism are their target audiences. Despite of their differences both agrotourism and rural tourism celebrate the charm and values of rural life and contribute to the preservation of local culture and provide economic support to locals.

The modern era tourism become “experience oriented”, which requires new dimensions and opportunities to explore authentic and innovative tourism experience. Travellers being more interested in finding more flexible and sustainable travel options, especially after pandemic outbreak. Travelers looking for relaxation and a closer connection with nature and tradition. They are getting attracted towards the charm of the countryside in this world that is frequently defined by urbanization and fast-paced living. Such tourists have exciting opportunities through rural tourism and agrotourism, two distinct kinds of tourism options with roots in rural settings. Although these both terms often used synonymously, there is a significant difference between them and each has its own unique beauty

Rural tourism and agro-tourism are two distinct forms of tourism which showcase different perspectives of rural life and also provides unique experiences for tourists. While both forms of tourism are rural based, they differ in their focus and offerings Rural tourism focuses on highlighting the charm of rural life and amenities provided by farmers and rural people to attract visitors to their area which aims to offer tourists an authentic rural life

experience. Agritourism, on the other hand, is more focused around visiting active farms and ranches which offers a hands-on opportunity to acquire knowledge about local food production through experiences like picking fruit, feeding animals, and tasting farm-fresh cuisine

Rural Tourism

UNWTO defines Rural Tourism as "a type of tourism activity in which the visitor's experience is related to a wide range of products generally linked to nature-based activities, agriculture, rural lifestyle / culture, angling and sightseeing. Rural Tourism activities take place in non-urban (rural) areas with the following characteristics: i) low population density, ii) landscape and land-use dominated by agriculture and forestry and iii) traditional social structure and lifestyle".

It has been considered as a means of achieving economic and social development and regeneration that can benefit to rural people for an effective source of secondary income and employment and has a potential to contribute in the revival of lost folk arts and handicrafts. It includes agricultural activity-oriented tourism (i.e., agro-tourism or leisure agriculture), culture-oriented activities (i.e., cultural and historical tourism, or museum tourism), and ecological nature-oriented recreation activities (i.e., nature tourism, agro-tourism, green-tourism, or ecotourism).

Rural tourism encompasses not only farm tourism, but also any tourist activity in rural areas that is understood to be a way of enjoying rural life within the community, as well as enjoying stunning rural landscapes and supporting rural prosperity and environmental quality. This comprises natural resources in the area, rural village environment and terrain (farmland and forestry, lakes, and mountains, diversity of agriculture, farm production, harvesting fruits, gardening, venues for forestry, livestock rearing and fishery operations) and local rural culture (rural buildings, historical architecture, cultural relics, temples, indigenous cultural practices and custom)

Functions of Rural Tourism

- **Cultural Function:** Preservation of cultural heritage to ensure the security of unique lifestyles, culture and folk arts of rural villages. At the same time, it also helps to create unique rural culture and cultural assets into promote rural tourism.

- **Social Function:** To establish contacts between urban people, rural villages, and rural areas, to increase farmer social networks, to close the urban-rural divide, and to improve the quality of life in rural areas.
- **Educational Function:** To provide opportunities for urban residents to learn about agriculture, including crop farming and animal rearing, as well as to experience rural life and appreciate its culture and ecosystems within local communities.
- **Therapeutic Function:** To make leisure activities available to the general public. This allows for close associations with natural landscapes and ecosystems in rural areas, which helps to relieve daily work stress and gives peace of mind to everyone who wishes to enjoy rural tourism.
- **Environmental Function:** To improve and update the rural environment's quality. It is also intended to safeguard natural landscapes and ecosystems, as well as to develop rural tourism in the community.
- **Economic Function:** To expand rural employment possibilities, raise rural income, and establish a thriving rural economy.
- **Recreational Function:** To provide public spaces for leisure activities and rural leisure excursions so that tourists have a positive experience throughout their stay.

Benefits of Rural Tourism

- Creates jobs and money for residents of remote rural areas. This is especially helpful for women, who sometimes lack new possibilities to earn money outside of the home.
- Develops a market for local products and services and keeps them alive.
- Promotes the conservation and protection of natural resources such as rivers, woods, and mountains, as well as local fauna and flora, birds, fish, and nearly extinct creatures. When these are valued as living assets in order to generate money, they are typically cared for.
- Encourages the preservation of old customs and traditions, crafts, traditional festivals, architecture, food, and other cultural practices.
- Because services are frequently offered by village inhabitants, rural tourism benefits the village by increasing collaboration among villagers as they conduct the local enterprise of catering for tourists.
- Offers chances for cultural exchange. These interactions, perhaps, will lead to increased understanding among peoples and stronger ties to the global family.

- Aids in slowing urbanization by providing a better economic future for rural families.

Agrotourism

World Tourism Organization (1998) defines as “Agri-tourism involves accommodation being offered in the farm house or in a separate guesthouse, providing meals and organizing guests’ activities in the observation and participation in the farming operations.”

Agrotourism is a type of commercial enterprise that combines agricultural production and/or processing with tourism in order to attract visitors to a farm, ranch, or other agricultural business for the purpose of entertainment, education and revenue generation.

Here a local farmer gives tour of their agricultural farm to tourists so that they can see how they grow, harvest, and process locally grown crops and provides farm-stay opportunities, including educational programs and recreational activities, are frequently provided by farmers.

It may include activities such as visiting a farm, watching and participating in farm activities, experiencing livestock such as cattle and goats, taking a bullock cart ride, spending a day or two surrounded by nature, eating food prepared by local farmers and labour, visiting a rural market, and other such allied activities related to an agriculture farm.

Agrotourism, which combines agriculture and tourism, offers a one-of-a-kind chance for people to connect with the land, adopt sustainable practices, and get a comprehensive appreciation of the crucial role agriculture plays in shaping our lives and communities.

Basic principles of Agro-Tourism

Three basic principles should guide agritourism are following:

- 1) **Something for visitors to see** - Agro-tourism can provide travellers with a variety of experiences, including animals, birds, farms, and nature. Tourists may also be drawn to Agro-tourism through culture, dress, festivals, and rural games.
- 2) **Something for visitors to do** -Tourists can participate in various farm and non-farm activities like harvesting, processing, cultural activities

- 3) **Something for visitors to buy** -Tourists can purchase rural crafts, clothing, farm gate fresh agriculture products, and processed meals as souvenirs.

Roles of Agro-Tourism in Rural Development

- It ensures cash flow throughout the off-season.
- Agritourism aids in the preservation and dissemination of rural values.
- Agricultural products can be sold by businesses that cultivate and harvest them.
- As a result, rural populations are employed.
- It preserves and communicates agricultural and rural values.

Benefits of Agro-Tourism for Farmers

- Operational expansion of farms.
- Farmers must enhance their farm revenue streams in order to protest income volatility. Creating new consumer niche markets
- Increasing the availability of local agricultural goods.
- Promoting local made agricultural products.
- Improving farm living and working conditions, as well as recreational opportunities.
- Instilling an entrepreneurial spirit and managerial abilities.
- Farm enterprises can become more sustainable over time.

Benefits for Communities

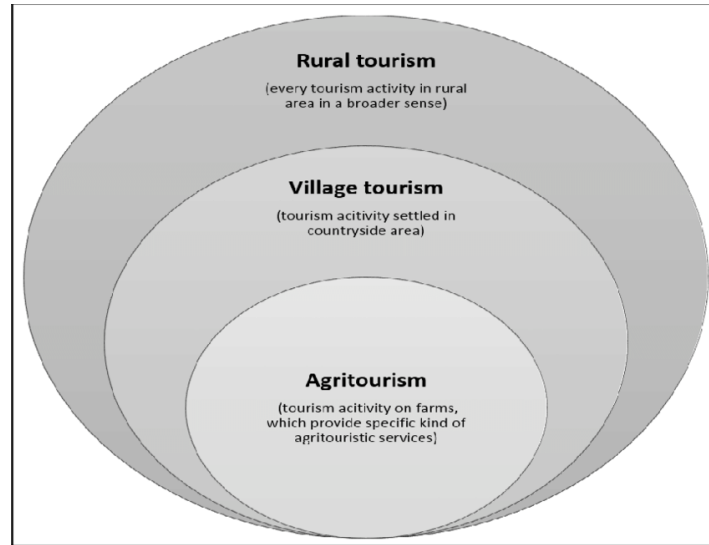
1. Businesses and services can generate additional money by recruiting travellers.
2. Tourists and people in rural areas should be protected against environmental damage.
3. Taking part in the preservation and revitalization of local art, craft, and traditions.
4. Increasing employment and income in rural areas in order to diversify and develop the rural economy.
5. By providing a more dynamic business climate, we hope to attract additional small enterprises and industries.

Contrasts Between Rural Tourism and Agro-Tourism

“Rural tourism” is considered the broader term encompassing a diversity of activities (e.g., “nature tourism”, “eco-tourism”) as long as those activities and experiences are offered

on a rural setting. Agro tourism is a part of rural tourism. Although these terms often used synonymously, there are differences between them as follows

Feature	Rural Tourism	Agritourism
Scope	Broader range of activities like ecotourism, exploring cultural and historical aspect	Primarily concerned about agricultural activities, farm visits, farm education, farm stays, and farm-to-table experiences
Rural Environment	Natural beauty, scenic landscapes are the major highlights	Agricultural landscapes, farming practices, livestock are the major highlights
Activities	Wide range of activities such as hiking, biking, nature walks, wildlife spotting, cultural events, heritage tours, and interacting with local communities are being offered	Activities directly related to agriculture, such as farm tours, farm stays, harvesting, animal feeding, playing with animals are being offered
Cultural Heritage	Exploration and celebration of the cultural heritage, traditions, folk dance, handicrafts, and local festivals of rural communities	Primary emphasis is on agricultural traditions, farming style, and the rural lifestyle
Economic Impact	Contribute in finance diversification, employment creation, and income generation in rural community	Provide additional sources income for farmers and agricultural communities
Accommodation	Offers a wide range of accommodation options, including countryside resorts, farm stays, guesthouses, and eco-lodges according to the preference of tourists	Farm stay is the major option for accommodation in case of agrotourism
Food Experiences	May include farm-to-table experiences, local cuisine, tasting locally produce products, and visiting farmers' markets	Focuses on farm-fresh food experiences, such as farm-to-local cuisine, agricultural product sampling, and learning about local food production
Educational Focus	Provide educational opportunities about rural environments, biodiversity, cultural diversity, customs, traditional handicrafts.	Offers educational experiences mainly focused on farming techniques, crop cultivation, animal husbandry, and sustainable farming practices



(source- https://www.researchgate.net/figure/The-relationship-between-rural-tourism-village-tourism-and-agritourism_fig1_317117744)

Similarities between Rural Tourism and Agro Tourism

- Both rural tourism and agrotourism take place in rural setting.
- Main objective is to taking advantages of rural resources to generate income.
- Providing immersive rural experiences to tourists.
- Helps in cultural exchange between tourists and locals.
- Support local economy.
- Helps in preservation of local culture, heritage, art.

Conclusion

Rural tourism and agro-tourism are both gateways to the soul of the countryside, each provides tourists a unique and unforgettable experience of rural setting. Both pathways lead to a greater appreciation for the land, the people, and the values that keep rural communities at its centre. Both pathways help in preservation of local culture, food and tradition. Despite of their similarity and dissimilarities, both contributes in the betterment of rural society.

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