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TRADITIONAL AGRICULTURAL PRACTICES OF ANCIENT INDIA: A BLUEPRINT FOR TODAY'S SUSTAINABLE FARMING

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ABSTRACT

Agriculture has been the backbone of Indian economy since time immemorial. Indian agriculture began by 9000 BCE as a result of early cultivation of crops and animals. The economic prosperity of India was a result of its agricultural well-being. The science of agriculture was highly developed as can be seen from the large number of texts such as Krishi Parashar written on the subject. Many of the ancient practices have been documented, experimented and validated by different researchers as agriculture continues to play a pre-dominant role in Indian economy. This paper tries to bring out the role and importance of ancient Indian agricultural practices. It also explores agricultural, methods and practices in seed, plant, tree, soil and water management.

Key Words: Sustainable, Krishi Parashar, Soil, farming, water management.

INTRODUCTION

Agriculture has been the backbone of Indian economy since time immemorial, Indian agriculture began by 9000 BCE as a result of early cultivation of crops and animals. The economic prosperity of the Indus Valley Civilization was a result of its agricultural well-being. In the Vedic age, cultivation of wide range of cereals, vegetables and fronts was undertaken. According to Tatteriya Samhita cultivation of at least fourteen types of corn was known to the people. (TV 2016) Animal husbandry was also important and provided meat and milk products. During the Buddhist period people retained their interest in agriculture. The evolution of gardening is intimately associated with Buddhist temples and monasteries.

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The Mauryan period also, laid great stress on the promotion of agriculture, forest produces, pasture lands, cows, horses and elephants. Mauryan facilitated and promoted agriculture with the construction and maintenance of canals and dams. Megasthenes, the Greek ambassador at the court of Chandragupta Maurya (321 BC – 297 BC) records that "Famine has never visited India and there has never been a general scarcity in the supply of nourishing food. (Singh 2017).

In southern India also, a wide range of crops such as rice, sugarcane, millets, black pepper were produced. between 200 to 1200 C.E. Periplus of the Erythean Sea records rich trade in India in Indian spices with the Roman world. During the Chola period, bureaucrats were appointed to oversee the distribution of water, particularly by tank and channel networks. Agricultural activities occupied an important place in Kashmir. Nilmata Purana mentions various rituals and ceremonies concerning agricultural activities (Jamwal 2019)

Importance of Agriculture in India

There has always been respect for farmers and he has been described as 'Anna datta' provider of food, King of kings, etc. Yajurveda says, that one should make efforts for producing abundant grains through agriculture. 'ते कृषि च संस्यं च मनुष्या उपजीवन्ति They are the people who live on agriculture and crops (Dwivedi 2018) In ancient times, more than 99% Indians practiced agriculture. (Nene 2012), Rig Veda Book 2 known as Vashishitha Mandal is dedicated to Agriculture, land and livestock. (Singh et al.2024), Various Suktas of Atharvaveda including Krisis, Anna samsiddhi talk about the significance of agriculture, one Sukta namely krise Sukta from Atharvaveda says " The men of wisdom and firm attitude bind plough fast and harness the yokes on the side to attain the wealth of grains among the men of learning," (Dwivedi 2018),

The virtues of a good farmer are described in the Krishi Parashar. (c.400 BC) a general text on the field crop agriculture …. "An agriculturist looks after the welfare of her cattle, visits in farms daily, has the knowledge of seasons, is careful about the seeds and is industrious is rewarded with the harvests of all kinds and never perishes." (Nene 2012).

Today, agriculture plays a vital role in Indian economy. According to the Ministry of Statistics and Program Implementation,2011 census, 54.6% of the population is engaged in agriculture

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and allied activities. Agriculture contributes 17.4% to the country's gross value added. (MOSPI, 2017)

CHALLENGES IN AGRICULTURAL PRACTICES IN PRESENT TIMES.

In order to increase agricultural production, the use of fertilizers and pesticides has steadily increased. The per hectare use of fertilizer in India N + P205 + k20) is 139.8 kg in 2023-24. (Annual Review of Fertilizer Production and Consumption, (ARFPC 2023-24) Punjab is the highest consumer of fertilizes in the country. It is the third highest consumer of chemical pesticides, average consumption very 221.42 kg per hectares compared to national average of 128.58 per hectare. (ARFPC 2023-24) In the Punjab Rayya Sabha, a question was raised, whether excessive and indiscriminate use of pesticides and fertilizers was poisoning the ground water in the Malwa region of Punjab, turning it into a cancer belt-? (Q &A no.4617, Punjab legislative assembly session) further, sampling of drinking water in Punjab, reported that one-fifth of the samples contained Nitrogen in Nitrate form (NO3-N) beyond permissible limits. The impact of Green Revolution becomes exceptionally stark in Punjab. The massive cancer epidemic that has impacted people in Punjab is symbolized by the 54703 Abohar Jodhpur Passenger Train, infamous as the Cancer Train' one of the most dominant causes of cancer being the increased use of pesticides and fertilizers. (Nevtekar 2016)

The Punjab is an example to illustrate that similar hazard patterns may prevail in other parts of the country due to the indiscriminate use of insecticides, pesticides and fertilizers. with drones, spraying fields with pesticides and fertilizers in a jiffy, the use of chemicals in future may become highly unproportionate. The need is therefore to adopt sustainable agricultural practices by reducing dependence on chemical fertilizers and pesticides.

WHAT IS SUSTAINABLE AGRICULTURE?

Sustainable agricultural practices integrate three main objectives -a healthy environment, economic profitability and social and economic equity. It includes promoting soil health, minimizing water use and lowering pollution levels on the farm. It also includes, using methods promoting farm worker well-being and environment friendly measures such as organic farming, waste-management, soil nutrient management, genetic modification of crops, and water quality management. (U.C,S.A. R&Ed Prog. 2021) In ancient Indian agricultural

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practices can be seen the integration of above three sustainable agricultural practices stated above. These ancient practices have the possibility to address the present day sustainable issues in agricultural practices.

INDIAN KNOWLEDGE SYSTEM AND SUSTAINABLE AGRICULTURAL PRACTICES

As stated above, agriculture in India dates back to 9000 BCE. It was revered, worshiped and a respected profession. Rich Literature on agricultural practices can be found in the Rig Veda, Vedic samhita, Kautilya's Arthashastra,. Brahasamhita, Charaka Samhita and Sushrat Samhita.Texts exclusively dedicated to agriculture and allied areas can also be found such as Krishi Parashar, Surpala's vrikshayurveda, Krishi Geeta and Thiruvuralskashyaguka Rishi sukti. Nilmata Samhita gives rich insights into agricultural practices in Kashmir. These texts are rich repositories of Indian wisdom much provide a ray of hope for resorting to sustainable agricultural practices. Valuable information on selection of seeds, land preparation, pest control, manure, grafting, soil selection plant propagation protection of plants from diseases can be gathered from these texts.

SUSTAINABLE AGRICULTURAL PRACTICES FROM ANCIENT INDIA

Classification of Soil

"Upon this handful of soil our survival depends. Husband it and it will grow our food, our fuel and our shelter and surround us with beauty. Abuse it and the soil will collapse and die, taking humanity with it." – Vedas Sanskrit scripture-1500 B.C (Singh & Chandran, 2015)

Vedic Indians had knowledge about the various soil types, their fertility and appropriateness of growing different varieties of crops on different soil types. Rig Veda identifies the soil on the basis of fertility as urvara (fertile), Ushara (barren), maru (desert) Aprenata (fallow) etc. (Roy,2009) Soil was also classified on the basis of crops, –vridheyam (rice rainfed / corn) , Shaleyam (kamala) wet/ rice) tilyan (seas amum) mashyam (black gram) Maudginam (mung bean). Sangam Literature has classified soil on the basis of vegetation as mullai (forest) kuring hills, Marudhan (cultivable) and mithal (coastal). Crops for best yields were to be grown on the basis of the soil. Sushruta classified the soil into five kinds for the purpose of growing drugs of different therapeutic properties (Sushruta Samhita p. I XI .) The Amarakosha of

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Amarasimha, a scholar in the court of Chandragupta II contains, information on soil, irrigation and agricultural implements. The Amarkosha describes 12 types of land in its chapter on Bhumivarga. In the Vaisyavarga are mentioned different kinds of soils and their suitability for the cultivation of specific crops e.g. ksetram-rice and corn, shaleyam (kalama rice), yavyam (awned barley),are crops mentioned in relation to the soils.(Rana 2020)

Soil Properties

According to Brahat Samhita, There should not be a sub soil water-vein running under a field. It shall make even the luxuriant crops perish (Brihatsamhita LIII-61)

Further it states, that the underground water ere is only 4 cubits below the surface of the soil, it shares constrain the sprouting of seeds and even the crops with appreciable growth shall allay Brihatsamhita (L.III, 89) Soil infested - with noxious weeds, with high degree of laterization, forest with abundant bamboo resources gravely substrates and sites subjected to heavy grazing and browsing pressure from the wild and domesticated animals have been described as unsuitable for forming purposes. (Kumar P.94)

Seed Management

Seeds must be collected in Magha or phagun. (January, mid Feb- March) After drying them up on the Sun, the seeds should be kept in small bundles after separating them from husk. Seeds of different classes must never be messed up and the grass particles should be carefully thrown away. Mixed seeds yield poor harvest. Grass particles in them result in the growth of weeds detrimental to paddy. Seeds closely tied up must not be allowed to come in contact with remnants of food as bacteria world there on food. and subsequently destroy the seeds. Seeds should not come in contact with fire smoke or water fish. Surpala took pains to classify plants and planting materials (Sadhale verse:45-51, 1996) and extraction of seeds (Sadhale verse:52, 1996). He propounds instructions on the treatment of seeds and planting materials to promote germination, seedling growth and seedling care.

Seed treatments

particularly for increasing fertility were mentioned in Arthashastra (2.24.24); they include soaking of seeds of grains, in dew and dried in heat for seven days, those of pulses for three (or five) days and nights, stalks for propagation are to be smeared with honey, ghee and pig's

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fat mixed with cow-dung, bulbous roots are to be smeared with honey and ghee, stone-like hard seeds are to be smeared with cow-dung before sowing.

A significant shloka in krishi parasar says

गोमयं स्यन्दनं देयं गोपर्णेन च मिश्रितम्। तत्परं खाद्यकं भवेत् फलपुष्पादि दायकम्॥

This means cow dung mixed with leaf compost should be used. It acts as a great fertilizer, yielding fruits and flowers. (Das 2024) Varahamihira (in Brhatsamhita 54.19-20) mentions use of procedures such as soaking, rubbing, boiling in and fumigation using various substances like milk, ghee, animal fats, honey, flesh of animals (hog and deer), roots and leaves of plants, pastes made of fruits and oils.

Crop Rotation

Crop rotation was practiced by raising black gram (urad) after rice. Gram is known for nitrogen fixation leading to good harvest of rice. The effectiveness of various legume species and their, micro-symbionts has been provided in several publications. (Montañez 2000) The Krishi Parashara emphasizes techniques like crop rotation and fallowing to prevent soil depletion and maintain fertility. A relevant shloka reads

उपज्यते वने तोयं वने च भूमिर्वर्धते। तां भूमिं सस्यां कुर्वन्तु खाद्यं च फलं च ददातु नः॥

This verse underscores the symbiotic relationship between forests and soil health, advocating for practices that enhance soil fertility through natural means.

Nourishing the plants : Manure and Manuring

Sweetness of atmospheric water and sweetness of soil were the two cravings of the Vedic people. Sweetness is intended to mean here fertility of soil and good water resources. The plant fertility depends on three factors: a) Conservation of top soil, b) Replenishment of soil exhaustion and c) Manuring of individual plant. Of these three, removal of soil exhaustion was possibly considered the best way to restore soil-fertility. (Roy, 2009)

For maintaining soil fertility two measures were adopted:

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1. **Manuring**: Manures of animal origin for the fertilization of soil was well recognized in the Vedic society. The Rigveda 22 recommends cow-dung (sakrt) for restoration of earth's youthfulness in a symbolic way of description of restoration of youth of the aged parents. heaven and earth by Rbhus. According to some this is a clear indication of nitrogen fertilizer for the removal of soil-exhaustion. (Roy,2009)
2. **Rotation of Crops**: The idea of rotation of crops revealed in the statement "Corn ripens twice a year" (Roy,2009) throws light on cultivation of grain-crop followed by cultivation of legumes, the only restorative plants fix nitrogen in the field which is exhausted with cultivation of grain-crop. Obviously, rotation of crops was made between two types of crops, grains and legumes. Kosambi observes, for obtaining proteins in forms of peas, grams, pulses, beans the practice of crop rotation was followed. Kautilya in the Arthasashtra spoke also, about a third crop. (Roy, 2009)

The next phase in the Vedic period is marked by other types of manuring in addition to the those prevalent in the earlier period.

Animal manures

These included use of two varieties of cow-dung manures, stable (gostha) and farmyard cow-dungs. Excrements of animals (purisa) were also recommended for this purpose.(Roy 2009)

Green manure

Pieces of wood of Terminalia arjuna, husk of barley and blossoms of sesame is found to have been recommended for removing defilements (removing something bad) from arable land. This may be taken as an instance of the practice of green covering of fields. The same practice is recommended by Varahamihira in 6th Century AD. Reference to husk of barley and wood of Terminalia shows fixing of nitrogen to soil.(Roy, 2009)

Manuring of seeds of Yava

The late Vedic period introduced manuring of yava (barley) seeds with clarified butter and honey as pre-sowing treatments of seeds. The mantras uttered for this practice are laid down in the Atharvaveda. (Roy 2009) The knowledge on mulching the soil surface (to save on water requirements), grafting, transplanting plant, plant protection seems to be well developed at the time vrikshayurveda was written.

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Pest control

In order to control the pest, the farmers used a variety of plant-based products, -crop residues, shell ash, cow came, cow dung, milk, and red earth sand.

Removal of Weeds.

Lord Parasuram prognosticated that rampant weed growth would deprive the crop of its nourishments. (Kumar 2008) Clean cultivation methods that curb the dispersal of wild rice seeds through seed admixtures or that arises from soil seed was advocated (Kumar 2008) Wood ash application was suggested for reducing weed infestation of the fields. (Kumar 2008) Weeding was manually done laboriously. According to Surpala's vrakshayurveda a discerning person should weed out all the grass growing in the vicinity and should dig it out from near the roots of the trees with a spade. (Sadhale 1996)

Weed control through sesame plantation

Brahat samhita mentions that when a piece of land was brought under a crop, sesame should be planted, chopped down and incorporated into the soil before seed was produced. Nene, conjectured based on reports from India and Nigeria that incorporation of sesame would reduce biomass of the obnoxious weed, cyperus roltundas and sesame is also a good crop for striga (commonly known as witchweeds).(Nene 2012) Therefore, Vrahamahira had good reason to recommend sesame for a new or fallow land. (Sadhale,1996, Pg.83)

Use of Organic Manure.

Vrahmahira details a number of substances and preparations possessing manuring properties. The list includes different combinations of dung of cow, buffalo, goat and sheep. Ghee (clarified butter),ushira, seasum, honey, vidanga, milk and melle water, mud, horse gram, black and green gram, barley, rice, roots of certain plants, ashes, paste of oil of anlanguium and cordia fruits, Stale meat, beef and marrows of hogs. Some trees were also irrigated with fish water. (Thakur 1998).

Kunapajal

For nourishing the plant kunapa has been mentioned. This was a fertilizer consisting of flesh meat and marrow of several animals. After cooking these, various other substances like oil

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cake, honey, black gram glue was added. The whole compound was preserved. By mixing with water, liquid fertilizer was prepared. Researches today have established that hog fat, porpoise oil consists of fatty acids. Kunapjal was found effective on Senna (Cassia Augustifolia) in a research by Brageshwar Joshi and A. K Dey. However, besides Kunapajal , fertilizers was also added. This resulted in increased plant height, biomass yield, number of pods per plant, and early crop maturity. (Brajeshwar, Joshi, & Dey, 2007).

Mohan's study recommends the use of Panchagavya as an organic growth promoter for small and marginally profitable vegetable crop farms. (Jeerankalagi, Biradar, Naik, Dhari, & Pujari, 2022) Panchagavya i.e. roots of five plant speciesare anti-viral, antifeedant, anti-fungal and anti-bacterial.

INDIGENOUS TRADITIONAL KNOWLEDGE FOR THE PROTECTION OF CROPS FROM PEST'S WILD ANIMALS AND BIRDS.

Plant Protection Measures: The Rigveda-Yajurveda period also adopted some preventive measures to protect plants and crops. These include method of driving away the pest-bird by din and noise. The Rigveda thus describes, "Like the farmers make noise to drive away the birds from fields". (Roy 2009) The other preventive measure was cultural control by rotation of crops. The Taittiriya Samhita– refers to rotation of crops. Obviously that practice also afforded natural prevention of crops from incest-pest. (Roy 2009) Integrated pest management methods cultural, organo-chemical, smoke was probably extensively used.

In order to control the pests, farmers used varieties of plant-based products crop residues, shell ash, cow urine and cow dung was also used. Milk, red earth sand was also used for protection and nourishment of the crops.

1**. Erection of mannequin**. With bright colour was done and is still widely practised the fury of the cloth keeps away the birds.

2-**Barbed fence** with babool (Acacia nilotica) , ber (Indian jujube) and other thorny plants was used. Planting of prickly thorny bushes like Karonda (carisa caranders) at the edges was undertaken. This injured nilgais making them cry in distress therefore no animal ventured in.(

Source (Sharma et al., 2023)

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3**. Interdependence of human and nature**: Ancient Indians were well aware of interdependence of human and nature. Natural predators were also used for protection of crops.

यः फल्गुः स्वपिति सानाय सुषुप्तानां च नाशयति। समृद्धं कुर्वीत धान्यमवभिन्नं यथा भवेत्॥

The one who rests on the mountain peak, ensuring the destruction of pests and the flourishing of grains. This verse highlights the use of natural predators to manage pests and protect crops, an early understanding of ecological balance. (Das 2024). During the cultural revolution in China, a campaign was started to kill birds, as they were eating away grains. The following years saw severe spells of famines in China. This was because the crops were destroyed by the insects which the birds were naturally eating. But, due to the massive campaign of killing of birds there were no more birds to eradicate the insects. (Murthy 2024)

Afforestation

Trees and forests recycle moisture in the atmosphere through the process of transpiration to increase rainfall. The importance of forest and trees to rainfall and water supply include: improvement of water cycle, reduction of runoff, improving the replenishment of the water table, filtration of water pollutants, control of floods and regulation of storm water, (Ekhuemelo 2016).

The importance of trees in the maintenance of environment and food chain was well-understood in ancient India. A Surpala verse in Vrikshayurveda says What is the use of several trees grown in the forest or sons who do not serve the purpose of dharma or Artha? Instead, a single tree by the wayside is far better whereupon people can rest. (Sadhale,1996) The saints and philosophers of the time extolled the people to grow more and more trees a slogan that we use today.

The importance given to trees can be thus understood “ten wells are equal to one pond, ten ponds are equal to one lake, ten lakes are equal to one son. Ten sons are equal to one tree. If one plants a pleasure garden abounding in bounties fruits (yielding many rewards then God, nymph Yakshas etc reside there for three ages.” knowing the truth one should undertake planting of trees since trees yield the means of attaining dharma, Artha Kama, moksha, the four aims of life. Planting of trees must have been linked to Dharma (religion) in order to encourage afforestation. Therefore, vrikshayurveda discusses at length - blessings falling upon

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people on plants trees. For example, planted Tulsi leads over to Vaikunth. and six Mango tree leads to attaining the abode of Garuda (Sadhale verse 9-23.1996)

Vrikshayurveda gives a detailed account on plantation of trees- preparation of the pit dimension and filling it up with manures, distance between trees. It also gives detailed treatment of plant ailments. for example. kunapa water with milk should be added to trees suffering damage due to frost or scorching heat…(verse 199, Sadhale,1996) Trees which day up due to heat caused by fire are cured when a mixture of sugar seasame and milk is used for watering and anointing them and when they are smeared all around by the med from the bottom of a lotus plant Similarly other remedies for different ailments has been prescribed in vrukshayurveda (Sadhale,1996 Verses 185 to 222).

Although forest clearing was suggested as a means to expand cropped areas elsewhere (B. Kumar 2008) the farmers were encouraged to plant trees and other woody perennials, The agriculturists are asked to stop forest clearing A steady increase in population may have warranted bringing more area under crops by clearly forest However, the authors clearly understood that this could not continue indefinably and forest destructions should be stopped so much so, the approach was to resort to clearing forest in times of food scarcity and to bring more lands under fee cover ants the times (Kumar 2008 p.91)

Sacred Groves

The existence of sacred groves in India dates back to pre-agrarian hunter-gathering era. The traditional communities have been protecting large tracts of natural forests as sacred groves, from time immemorial keeping aside sanctified areas of forests. These communities establish rules and customs to ensure their protection. Only a vaidya (physician) was allowed to enter the sacred grove to gather herbs (Murthy 2024) The sacred groves are even today, dedicated to local folk deities Ayyanar and Amman or tree spirits. The rules of the grove protected the felling of the trees, collection of any material from the forest floor and killing of animals. for example, The Garo and Khasi tribes of north-eastern India completely prohibit any human interface in the sacred groves. In other sacred groves dead wood or dared leaves may be picked up but the live trees or its branches are never cut. The Gonds of central India prohibit the cutting of a tree but allow fallen ports to be used.

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Lord Buddha was born in a sacred grove of Lumbini. The place could have been chosen as sacred groves are serene and sacred places, rich in medicinal plants and entry is restricted. The sacred groves have played an important role in conserving the forest and its constituent bio-diversity elements. These sacred groves have high ecological significance as they protect watershed, critical habitants and often house rare and endangered species amphibia, reptiles, birds and butterflies. The groves are often associated with ponds, streams or springs This helps in meeting the water requirements of the local people. The vegetative cover also helps in the recharging of aquifers. Today, sacred groves are fast decreasing and need to be conserved. Disappearance of traditional belief systems fundamental to the concept of sacred grove is now considered to be a taboo or superstition Loss of forest rights of the tribal communities, rapid urbanization, developmental internation like roads, railways and highways are some other causes of their disappearance. Besides, there is no legislative protection implemented in India so far for their protection (Kandari et al. 2014).

WATER MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN ANCIENT INDIA.

Prediction of Rainfall

Vrahmairs Brihatsamhita is a treatise that deals in detail on the conception, pregnancy and delivery of clouds. The prediction of immediate rain from surrounding phenomenon is also given. The treatise also provides meteorological information like halo around the Sun and moon, lines of clouds crossing the solar disc at rising & setting, winds, the red sky immediately before sunrise and after sun set, fanciful shapes of clouds of dust storms and thunder bolts. (Vaidya, Pandey, & Dhabale, 2023)

Besides, biological indicators of monsoon were also used in order to ascertain appropriate time of plantation of seeds. for example: - It was observed that the plant Cassia Fistula (Amaltas) flowers in abundance 45 days before the onset of monsoon. Kannani, found out that there was a difference of 3-1 days between onset of monsoon and that predicted at Junagadh based on flowery of Amaltas during 1996-2003.(Kannani et al. 2005)

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Observation on the behaviour of specific birds and ants have also been used as indicators of rain. A sparrow bathing in dust indicates good rain. If crows cry during night severe drought is indicated

short range rain forecasting was also done for example movement of dragonflies. This was confirmed by a study in 1993. The dragonflies migrate in swarms signalling rain, a few hours before the humidity approaches saturation. Flapping of ears by goats was confirmed by Chhaganthai in 1992 indicating short range rainfall ow increasing moisture, causing increased uneasiness and sweating to goat which makes then flap their ears. Movement of black ants in a row indicates short range ramped and was confirmed by a study by Selvanayagum in 1991. The hair is shaped like a hook, enabling worker ants to carry larval ants as they do not have eyes and legs at this stage. This process is observed with thousands of ants moving in a stream thereby indicating rains. These signs of approaching rains or no rains were used to plan the time for preparation of soil, planting of seeds and other agricultural activities. (Vaidya, Pandey, & Dhabale, 2023)

Construction of canals, lakes and tanks

Indians built canals as early as in Indus valley civilization. Possibly, due to the flooding of the Indus Valley every year from May to August. The water used to be stored for cultivation in winter in lowlands. Urban Harappan civilization developed wells of their kinds in South Asia. A sound agricultural basis thrived because of rain water harvesting and detection system. (Bhattacharya 2012). Farmers of Harappa frequently used contouring, bunding, terracing and benching. Gabarbands (dams) and canals in in order to harness utilize or slow on water and soil movements. (Bhattacharya 2012). The story of Aruni revered Vedic sage who is mentioned in many Vedic era Sanskrit texts, talks of breach in the embankment that held water.

Artificially constructed dams served a variety of functions terracing or deserting water in order to retain and distribute silt from flood waters and thereby add to the fertility of agricultural fields.

Dockyard at Lothal could also have served as a water reservoir. It is since the days of Kautilya that public policy and other relief policy were developing. (Bhattacharya 2012). The Arthashastra gives us idea of principles and methods management of irrigation systems.

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Megasthenese speaks of a band of officers who superintend the rivers, measure by the land and inspect the sluices which the water is let out from the main canals into their branches so that everyone has an equal supply of it

several former of bunds.

Sudarshan lake dates back to Chandragupta Maurya's period (324 BCE), this was later repaired and made three times stronger and durable than before (triguna drdhatara) during the saka period by pariman amatya Suvisakha the Governor of Rudradaman, at personal cost. There is no doubt that on the lake depended the prosperity of the people of the area for a long time.

During Asoka's period wells (kupa) were established at regular intervals on the highways. ring wells in the post-Mauryan period must have been used for irrigation.

Ancient Indians used observation-based inferences to find out the availability of ground water. Surpala mentioned that the natural occurrence of trees Syzygu curmini and Scirpus grossus indicates availability of water (Sadhale,1996 verse 304). Further, it states on digging the depth of half a man-height if a frog of whitish colour and yellowish soil are seen then these are indications that on penetration further through the larger layers the rock beneath it will contain abundant water

If to the east of a jambu tree there is an ant hill, then to the southern side of there is plenty of water at the depth of two men heights. (Sadhale,1996)

Strict punishment was prescribed for polluting or damaging water places. Manu ordains that one who destroys the embankments of tanks, ponds, channels or even rivers should be subjected to the punishment of heaviest fines. (Bhattacharya 2012)

References to construction of embankments in Kashmir by a king called Damodara and by his minister Baladiya have been found. (Jamwal 2019) These embankments were made to protect the culturable land from floods and to pass the surplus water collected into different channels for irrigation. Kalhan mentions king Suvarna who built the canal suvarnamani.

Lakes, rivers and springs were used for irrigation in Kashmir. Suyya an engineer belonging to the Avantivarman's court, observed the obstruction in the waters of river Jhelum (Vitasta) and

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through public participation cleared the gorge. Suyya also succeeded in joining the rivers the Sindhu and vitasta thus making a particular area of the valley fit for agricultural use. Kalhan poetically states that Suyya makes the river dance the way the snake charmer maker a snake dance. Irrigation was carried out in different stages:

Different types of soil were collected from each village. Time taken by different types of soil to dry up was recorded. It was decided on the basis of the period within which irrigation would be required for each type of soil. Finally, arrangements were made on permanent basis for the size and distribution of water for each village. Increased agricultural produce due to these efforts of Suyya lowered the average price of a Khari of rice from 200 to 36 dinars. (Jamwal 2019)

WAY FORWARD

Several efforts and experiments in practising ancient indigenous methods are underway in different parts of India and have yielded promising results. Deccan chronicle reported the cultivations of 40 quintals of black rice (Krishna Vrihe) from a 2-acre farm with Vedic agricultural experiment. The was done by Kautilya Guduru, National Sanskrit Utd. Tirupati student of M.A. Yajurveda. (Deccan Chronicle 8 may 2021).

In a project titled “Vedic Farming”, Guduru Koutilya proved the techniques given in some famous ancient scriptures like “Krishiparasara”, “Vrikshayurveda", “Samhitas” etc. Seed germination test was conducted on “Krishna Vrihi” to evaluate its performance under different treatments viz. Honey, milk and Water. It was observed that the seeds coated with honey showed the highest percentage of seed germination of 78% followed by milk - 76% and in water - 68%. (Guduru K.2021)

Present day viability of ancient practices can also be seen from the fact that Sikkim has been declared India's first fully organic state, utilizing traditional farming methods that include natural fertilizers and crop rotation. The state's policies align with ancient practices documented in the Krishi Parashara, demonstrating align with ancient practices documented in the Krishi Parashara, demonstrating the relevance of these age-old methods in modern sustainable agriculture.

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Agroforestry in Southern India Farmers in Southern India are increasingly adopting agroforestry, integrating trees with crops to improve soil fertility, prevent erosion, and increase biodiversity. This practice is deeply rooted in the ancient understanding of the symbiotic relationship between trees and crops in Rajasthan the revival of traditional water harvesting techniques, such as 'Johads' (small earthen check dams), has helped in rejuvenating groundwater levels and ensuring water security in arid regions. These methods echo the ancient emphasis on efficient water use and rainwater harvesting.

CONCLUSION

These ancient insights highlight the deep wisdom embedded in traditional farming practices, many of which continue to resonate with modern agricultural approaches that prioritize environmental conservation and resource efficiency.

Ancient Indian agricultural wisdom underscores the importance of sustainability, a concept that modern technology strives to achieve through cutting-edge advancements. For instance, the focus on maintaining healthy soil in the Krishi Parashara aligns with the goals of metagenomics and advanced soil health monitoring. The use of natural fertilizers is echoed in the development of bio-fertilizers through biotechnology. Proper water management, emphasized in the ancient text, finds its modern counterpart in precision irrigation systems driven by AI.

It is time to study our agricultural heritage and relearn old lessons to the extent possible.

Ancient agricultural practices are essential for building resilient agricultural systems today. Modern farmers can learn valuable lessons about sustainability and environmental stewardship for long term success. It would not be wise to suggest implementation of whatever was written thousand years ago without experimentation and modern-day contextualization. But the ancient agricultural practices do give us insights and leave us with a challenge for exploration for the future. We need to look back at the past with reverence backed with scientific inquiry, so that we can understand the reasoning and wisdom of ancient times and plan for times ahead!!

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