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ARTICLES

சங்க இலக்கியச் சூழலியல்: மருதத்திணையின் நிலைத்த வேளாண்மை அறிவும் காலநிலைத் தாங்குதிறனும் – ஈரோடு மற்றும் சுற்று வட்டாரப் பகுதிகளை மையமாகக் கொண்ட ஓர் ஆய்வு

Sangam Literary Ecology: Sustainable Agricultural Knowledge and Climate Resilience of the Marutham Landscape – A Study Focusing on Erode and Its Surrounding Regions

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ABSTRACT

The Marutham landscape of Sangam literature documents a traditional ecological knowledge system that integrates soil, water, climate, crops and human society, and many elements of this knowledge persist in the agricultural practices of farmers in Erode District. This study selects agriculture-related poems through purposive sampling from Ainkurunuru, Kuruntokai, Natrinai, Akananuru, Purananuru, Pattinappalai and Porunaratrupadai, along with Tolkappiyam and Thirukkural, and compares them with the local agricultural knowledge of the Cauvery, Bhavani, Noyyal, Lower Bhavani and Kalingarayan irrigation regions. The Marutham poems document five components of resilience knowledge: fixing sowing periods from seasonal indicators; storing and distributing water through tanks, ponds and canals; choosing crops and manure according to soil characteristics; a diversified agro-ecosystem integrating fields, ponds, fish and trees; and shared responsibility between the state and communities for protecting water resources. These elements connect directly with contemporary practices in the Erode region, including canal irrigation, mixed cropping, the revival of millets, the Korangadu grazing system and local seasonal forecasting. The study argues that Sangam ecological knowledge should be viewed not merely as historical information but as a knowledge framework that offers valuable insights for climate-smart agriculture. By examining the continuity, transformation and applicability of this knowledge in Erode and its surrounding regions, it highlights the potential of traditional ecological practices to contribute to sustainable agriculture and climate resilience.

ஆய்வுச் சுருக்கம்

சங்க இலக்கியத்தின் மருதத்திணையானது, மண், நீர், பருவநிலை, பயிர் மற்றும் மனித சமூகம் ஆகியவற்றை ஒருங்கிணைத்த ஒரு பாரம்பரியச் சூழலியல் அறிவுக் கட்டமைப்பைப் பதிவு செய்துள்ளது. இவ்வறிவின் பல கூறுகள் ஈரோடு மாவட்டத்தின் தற்போதைய விவசாய

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நடைமுறைகளில் இன்றும் தொடர்ச்சியாகப் பின்பற்றப்பட்டு வருகின்றன. ஐங்குறுநூறு, குறுந்தொகை, நற்றிணை, அகநானூறு, புறநானூறு, பட்டினப்பாலை, பொருநராற்றுப்படை உள்ளிட்ட சங்க நூல்களிலிருந்தும், தொல்காப்பியம் மற்றும் திருக்குறளிலிருந்தும் வேளாண்மை சார்ந்த பாடல்கள் மாதிரி முறையில் தேர்ந்தெடுக்கப்பட்டுள்ளன. இப்பாடல்களின் கருத்துகள், காவிரி, பவானி, நொய்யல், கீழ்பவானி மற்றும் காளிங்கராயன் பாசனப் பகுதிகளின் உள்ளூர் வேளாண்மை அறிவுடன் ஒப்பிட்டு ஆய்வு செய்யப்பட்டுள்ளன. மருதநிலப் பாடல்கள் ஐந்து வகையான தாங்குதிறன் அறிவுக் கூறுகளைப் பதிவு செய்கின்றன: பருவ அறிகுறிகளின் அடிப்படையிலான விதைப்புக் கால நிர்ணயம்; ஏரி, குளங்கள் மற்றும் வாய்க்கால்கள் சார்ந்த நீர் சேமிப்பும் பகிர்வும்; மண்ணின் தன்மைக்கேற்ற பயிர்த் தேர்வும் எருவிடுதலும்; வயல், குளம், மீன் மற்றும் மரம் இணைந்த பன்முக வேளாண் சூழல் அமைப்பு; அரசு மற்றும் சமூகம் இணைந்த நீர்நிலைப் பாதுகாப்பு. இக்கூறுகள் அனைத்தும் ஈரோடு பகுதியின் வாய்க்கால் முறைப் பாசனம், கலப்புப் பயிரிடல், சிறுதானிய மீட்டெடுப்பு, கொரங்காடு மேய்ச்சல் அமைப்பு மற்றும் உள்ளூர்ப் பருவக் கணிப்பு ஆகிய நடைமுறைகளுடன் நேரடித் தொடர்பைக் கொண்டுள்ளன. சங்க கால அறிவை வெறும் வரலாற்றுச் செய்தியாக மட்டும் கருதாமல், இன்றைய காலநிலை-நுண்ணறிவு வேளாண்மைக்குத் (Climate-Smart Agriculture) தகுந்த வழிகாட்டும் ஒரு முக்கியச் சூழலியல் அறிவுக் கட்டமைப்பாக அணுக வேண்டும் என்பதே இவ்வாய்வின் மைய நோக்கமாகும்.

திறவுச் சொற்கள்: மருதத்திணை; சங்க இலக்கியம்; நிலைத்த வேளாண்மை; பாரம்பரியச் சூழலியல் அறிவு; காலநிலைத் தாங்குதிறன்; ஈரோடு

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1. Introduction

Climate change is one of the most important challenges facing Indian agriculture today. Erratic rainfall, prolonged droughts, rising temperatures and falling groundwater levels are affecting the livelihoods of small and marginal farmers in particular. In Tamil Nadu, too, rising temperatures and increasing rainfall variability have led farming communities to adopt various adaptation strategies. In this context, it becomes important to integrate local and traditional knowledge with modern science and technology. The experiential knowledge of soil, water, climate, crops and living beings held by communities that have lived in harmony with nature for generations can benefit sustainable agriculture and climate resilience. This land-based knowledge of the Tamils is recorded extensively in Sangam literature. Tolkappiyar not only divided land into five *tiṇai* – *Kurinji*, *Mullai*, *Marutham*, *Neithal* and *Palai* – but also linked to each landscape its proper land, time, living beings, occupations and elements of life.

முதல் எனப்படுவது நிலம் பொழுது இரண்டின்

இயல்பு என மொழிப இயல்பு உணர்ந்தோரே

Those who understand the nature of things declare

that what is called the primary element is the nature of the two – land and time.

— Tolkappiyam, Porul. 4

This *Tolkappiyam* aphorism shows that land and time were regarded as the basic elements of life. Likewise, the phrase "*vēntaṉ mēya tīmpuṉal ulakamum*" (the world of sweet waters dear to Vēntaṉ) reveals the water wealth of *Marutham* and its agriculture-based way of life. In the *Marutham tiṇai*, river, water body, field, irrigation, soil, climate, ploughing and livestock appear as an integrated, interdependent system of life. In this respect, Erode District and its surrounding regions form an important setting for this study. The Cauvery, Bhavani and Noyyal rivers, the Kalingarayan canal and the Lower Bhavani Project play a significant role as water sources in the agricultural life of the region. At the same time, rain-fed dry lands and drought-affected areas are also found here. The region is therefore a suitable setting for a comparative study of the traditional agricultural knowledge of *Marutham* and the agricultural practices of present-day Erode District.

2. Objectives and Approach of the Study

2.1 Primary Objective

To identify the traditional knowledge of sustainable agriculture recorded in the *Marutham tiṇai* of Sangam literature, to compare it with the local agricultural knowledge and practices of Erode and its surrounding regions, and thereby to bring out the agricultural and ecological elements of resilience that can help in meeting climate change.

2.2 Secondary Objectives

1. To identify the agricultural and ecological knowledge of the *Marutham tiṇai* recorded in Sangam literature.
2. To examine the interrelationships of soil, water, crops and climate in the *Marutham* landscape.
3. To identify the water-management and irrigation knowledge of the Sangam age and explain its characteristics.
4. To document the local agricultural knowledge and climate-adaptation practices of Erode and its surrounding regions.
5. To compare the similarities, differences and continuities between Sangam agricultural knowledge and present-day local agricultural practices.
6. To identify elements of traditional knowledge that can serve sustainable and resilient agricultural practices in the context of climate change.



Figure 1. Sangam Marutham knowledge and Erode agricultural knowledge: a comparative framework (infographic; labels in Tamil)

Figure 1 compares the knowledge of the Sangam *Marutham tiṇai* with the local agricultural knowledge of Erode and shows how sustainable agriculture and climate resilience can be built from them. The two bodies of knowledge are linked through five dimensions: soil, water, climate, crops and community.

2.3 Research Approach

A mixed approach combining literary analysis, fieldwork and comparative ecological analysis has been followed. Modern concepts – Traditional Ecological Knowledge, Agroecology, Climate Resilience and Local Knowledge Systems – are used as the analytical framework.



Figure 2. Literature and local agricultural practice: a comparison across six dimensions (infographic; labels in Tamil)

Figure 2 compares the agricultural methods described in literature (the Sangam *Marutham* poems) with the local agricultural methods practised in the Erode region. It compares six key dimensions: seed selection, ploughing, manuring, crop protection, livestock care and seasonal forecasting.

Sangam literature is not merely poetry; it is a deep treasury of the ancient Tamils' knowledge of land, water, climate and ecology. Among the *akam tiṇai*s of Sangam poetry, *Marutham* describes fertile fields and the land around them, together with the agrarian way of life established there. A detailed study follows of how the nature-based sustainable agriculture and climate resilience practised by the ancient Tamils in the *Marutham* landscape remain relevant in the modern context, and particularly in the agricultural setting of Erode District.

3. The Marutham Tiṇai in Sangam Literature: Land and Life

3.1 The Natural Setting of Marutham

Marutham is an alluvial plain enriched by water bodies such as rivers, ponds and tanks. Enriched by the silt deposits that rivers bring, its soil formed an environment suited to cultivating paddy and other crops. The natural setting of *Marutham* is thus an ecological system in which water, soil and agriculture are interdependent. Plants such as the *marutam*, *vañci* and *kāñci* trees, and aquatic flowers such as the lotus, *āmpal* (water-lily) and *neytal*, show the biological wealth of this landscape.

3.2 Rivers, Tanks, Ponds and Water Storage

In the Sangam poems, the prosperity of *Marutham* is mostly recorded as an integrated scene of river, field, water body, paddy, fish and waterbirds. *Pattinappalai* portrays the abundance of the Kaviri's waters and the fields it created. The praise of the Kaviri as "*vāṉ poyppiṉum tāṉ poyyā*" ("though the sky fails, it does not fail") shows how indispensable the river's water was to agrarian life.

Besides natural rivers, man-made reservoirs such as tanks (*ēri*), ponds (*kuḷam*) and village drinking ponds (*ūruṇi*) were important to the agricultural wealth of *Marutham*. Sangam records indicate that the people of the time possessed water-management knowledge for impounding river water and supplying it to the fields as needed.

அறையும் பொறையும் மணந்த தலைய

எண்நாள் திங்கள் அனைய கொடுங்கரைத்

தெண்ணீர்ச் சிறுகுளம் கீள்வது மாதோ

Alas – the small tank of clear water, set among rocks and hillocks,

its curving bank like the moon on the eighth day,

is now breaching!

— Purananuru 118

In this way the protection of water bodies is described. The adaptation of *Marutham* is thus understood to include not only the use of natural resources but also the social knowledge of storing, sharing and using them for agriculture.

In *Purananuru* the importance of water is linked with kingship and agricultural prosperity:

நீரின்று அமையா யாக்கைக்கு எல்லாம்

உண்டி கொடுத்தோர் உயிர் கொடுத்தோரே

For all bodies that cannot exist without water,

those who gave food have given life itself.

— Purananuru 18

This idea shows that water and food are the foundation of life. On this basis, the Sangam *Marutham* landscape may be regarded not simply as "farmland" but as a traditional ecological system in which river, reservoir, alluvial soil, agriculture, settlement and biodiversity functioned interdependently.

3.3 The People of Marutham

The occupation of ploughing, known as agriculture, developed in the *Marutham* landscape. The ancient Tamils were engaged in full-scale agriculture especially along the Tamiraparani and the Kaviri, where large landholders irrigated their lands. *Tolkappiyam* does not separately name the people of *Marutham*; Tolkappiyar explains in his exposition of *akapporuḷ* that the names of people are classified according to the land proper to each:

ஏனோர் பாங்கினும் எண்ணுங் காலை

ஆனா வகைய திணைநிலைப் பெயரே

When the other peoples too are considered,

the names derived from the tiṇai are of unfailing kinds.

— Tolkappiyam, Porul. 968

Nampi Akapporuḷ names two classes of *Marutham* people:

உழவர் உழத்தியர் கடையர் கடைசியர்

Ploughmen and ploughwomen; field labourers, men and women.

— Nampi Akapporul 23

Puṟapporuḷ Veṇpāmālai says:

களமர் கதிர்மணி காலோகம் செம்பொன்

வளமனை பாழாக வாரிக் – கொளன் மலிந்து

கண்ணார் சிலையார் கவர்ந்தார் கழல் வேந்தன்

நண்ணார் கிளை அலற நாடு

Sweeping away the field-workers, bright gems, iron and red gold

till rich houses lay in ruin, the archers of the anklet-wearing king

seized the land, while the kin of his foes cried out.

— Purapporul Venpamalai 15

We thus learn that the *Marutham* people were known by names recorded in the grammatical works, such as *uḻavar*, *uḻattiyar*, *kaṭaiyar*, *kaṭaiciyar*, *ūraṉ*, *makiḻaṉ* and *kaḷamar*.

After the revival of Chola rule in the ninth century CE, the *Marutham* landscape underwent considerable expansion and growth. The Cholas conquered Tondainadu and Kongunadu and extended agriculture into the lands

of communities such as the Kurumbar and Vettuvar living there. They also settled Vellalar communities and expanded the area under cultivation. As a result, many of the Kurumbar, Vettuvar, Irular and others were turned into agricultural labourers and absorbed into the social structure of *Marutham*. The *Tivākaram* lexicon appeared in the very period when these changes took place. It says:

களமர் தொழுவர் மள்ளர் கம்பளர்

வினைஞர் உழவர் கடைஞர் இளைஞர் (என்று அனையவை)

கழனிக்கு அடைந்தவர் (பெயரே)

Kaḷamar, toḻuvar, maḷḷar, kampaḷar,

viṉaiñar, uḻavar, kaṭaiñar, iḷaiñar – such are

the names of those bound to the fields.

— Tivakaram 130

The *Piṅkalam* lexicon says:

களமர் உழவர் கடைஞர் சிலதர்

மள்ளர் மேழியர் மருத மாக்கள்

Kaḷamar, uḻavar, kaṭaiñar, cilatar,

maḷḷar, mēḻiyar – the people of Marutham.

— Pingalam 132

It thus names six divisions of *Marutham* people. Further, the *Cūṭāmaṇi* lexicon speaks of seven divisions:

களமரே தொழுமரே மள்ளர்

கம்பளர் உழவரொடு

வினைஞர் கடைஞர்

Kaḷamar, toḻumar, maḷḷar,

kampaḷar together with uḻavar,

viṉaiñar and kaṭaiñar.

— Chudamani 71

3.4 The Way of Life of the Marutham People

Agriculture was the primary occupation of the *Marutham* people. Ploughmen and ploughwomen lived by land, water and livestock. The plough, draught oxen, paddy, fields and irrigation were the main elements of their life. Settlements such as the *ūr* (village), *pērūr* (large town) and *mūtūr* (ancient town) grew around agricultural production. The *Marutham* poems also record aspects of social life such as family relations, lovers' quarrels (*ūṭal*) and liaisons with courtesans (*parattaiyar*).

உழுதுண்டு வாழ்வாரே வாழ்வார்; மற்றெல்லாம்

தொழுதுண்டு பின்செல்பவர்

Those who live by the plough alone truly live;

all others eat by bowing to them and follow in their train.

— Thirukkural 1033

This couplet clearly states the social importance of agriculture. In Sangam literature too, *Marutham* is recorded in close connection with fields, paddy, ploughing and water.

3.5 Courtesans in the Marutham Landscape

In the records of *Marutham* social life, references to courtesans (*kaṇikaiyar*) and concubines (*parattaiyar*) deserve to be read in relation to family structure, artistic culture and social morality. In Sangam literature, references to courtesans do not occur within the elaborate social structure seen in later literature. Nevertheless, *Paripadal* contains the phrase:

மாயப் பொய் கூட்டி மயக்கும் விலைக் கணிகை

... the courtesan who sells her favours, beguiling with artful lies ...

— Paripadal 20.49

This indicates that the concept of the courtesan was present in Sangam records.

3.6 Parattaiyar and Family Relations in Marutham

In the *akam* poetry of *Marutham*, the relationship of hero and heroine, lovers' quarrels and the hero's liaisons with *parattaiyar* are recorded as important aspects of life. The *Marutham* poems show the heroine sulking because the hero seeks a courtesan, and the confidante (*tōḻi*) acting as mediator to reunite the hero with the heroine. This can be related to the type of separation called *parattaiyiṟ pirivu* (separation for a courtesan) mentioned in the *Akattiṇaiyiyal* of *Tolkappiyam*. Thiruvalluvar, too, expresses the heroine's state of mind:

நண்ணேன் பரத்த நின் மார்பு …

... I will not come near your chest, O faithless one.

— Thirukkural 1311

Through this we may say that infidelity (*parattamai*) was not only a matter of personal relationships but was also part of family morality and social life.

The records from Sangam literature to *Silappatikaram* are important literary evidence for studying how the view of courtesans and *parattaiyar*, family relations, artistic culture and ethics changed over time in *Marutham* society. It is appropriate to approach these records not as evidence that demeans any community, but as cultural documents reflecting the family structure, gender relations, artistic culture and social values of their time.

3.7 Occupations of the Marutham People

Ploughing was the chief occupation of the people of *Marutham*. Sangam literature records the agrarian life of *Marutham* and the occupational knowledge of farmers in many places. Words such as *uḻavar*, *uḻattiyar* and *kaṭaiciyar* reveal a social structure centred on agriculture.

Literature depicts agricultural tasks such as ploughing after garlanding the plough and plough-handle with a wreath of red paddy ears, *aruku* grass and *kuvaḷai* (blue water-lily) flowers, cutting and heaping the paddy, and ploughing with yoked bullocks. There is also a tradition of singing while working so as not to feel the fatigue of labour; such songs are said to have later been called *mukavaip pāṭṭu*.

3.8 The Song of the Auspicious Plough (Ēr Maṅkalam)

The *ēr maṅkalam* (auspicious-plough song) is connected with the agricultural work of the *Marutham* people. As Kovalan, Kannaki and Kavunthi Adigal travel from Puhar towards Madurai, passing Uraiyur in the Chola country, Ilango Adigal depicts the activities of the farmers there.

Silappatikaram tells how farmers, wearing garlands of *aruku* grass, *kuvaḷai* flowers and paddy ears, stood by their ploughs and sang the auspicious-plough song:

படுநுகம் பூணாய் பகடே மன்னர்

அடித்தளை நீக்கும் வெள்ளணி யாமெனும்

தொடுப்பேர் உழவர் …

"Bear the yoke laid upon you, O ox;

we are the festive rite that frees the fetters from kings' feet,"

say the ploughmen at the first ploughing …

— Silappatikaram 27.228–229

These lines reveal an agricultural culture centred on the plough, the bullocks and the labour of the farmers, and show that ploughing was closely bound up with social life. The *ēr maṅkalam* can therefore be regarded not merely as a work song but as an expression of *Marutham* culture integrating ploughing, nature, livestock and human labour.

3.9 Women's Contribution to Agriculture in Marutham

The women of *Marutham* also played a significant part in agricultural work. Women engaged in weeding, transplanting seedlings, guarding the fields and harvesting. The activities of women engaged in agriculture are noted in many places in Sangam literature.

வளவயல் இடையிடைக் களைகளை கடைசியர்

பதலை அரியல் பாசிலைப் பருகிய

மதலைக் கிளியின் மழலைப் பாடலும்

… and the lisping songs, like a young parrot's,

of the field-women who pluck weeds here and there in the fertile fields,

having drunk toddy from pots in cups of green leaf …

— Perunkathai 142–144

Scenes such as this from *Perunkathai* convey field work and the collective nature of labour. Likewise, *Silappatikaram* tells of women transplanting seedlings who sang merrily after drinking toddy. These sources show that agriculture was not the work of men alone but a collective labour undertaken jointly by men and women, and that women's contribution was indispensable to the economic life of *Marutham* society.

3.10 Songs Connected with Agricultural Work

In the Sangam age, the tradition of singing at work combined labour with artistic sensibility. In particular, women working in the fields made noises and sang to protect the crops from birds. *Kurinjippattu* refers to such crop-guarding activities:

தட்டை புடைப்பின் அயலது

கட்டழகு நுண்ணிலை காயா …

When the bamboo rattle is struck, nearby …

the kāyā with its fine and delicate leaves …

— Kurinjippattu 40–44

Such literary references help us understand the agricultural knowledge, labour practices and crop-protection methods of the Sangam people.

3.11 Field–Pond–Tree–Fish: An Integrated Agro-Ecosystem

A poem by Alangudi Vanganar presents the integration of field, pond, tree and fish in a single scene:

கழனி மாஅத்து விளைந்துகு தீம்பழம்

பழன வாளை கதூஉம் ஊரன்

The man of the town where the vāḷai fish of the pond

snatches the sweet ripe fruit that drops from the mango by the field.

— Kuruntokai 8

The sweet fruit that ripens and drops from the mango tree on the field bund is seized by the *vāḷai* fish living in the nearby pond. In *akam* poetics this is an implied simile (*uḷḷuṟai uvamam*) alluding to the hero's infidelity; but the landscape that forms the background of the simile is ecologically subtle. Field (*kaḻaṉi*), bund tree (mango), water body (*paḻaṉam*) and fish (*vāḷai*) are joined within a single agricultural unit. Bund trees provide shade and organic matter, and the pond serves both as water storage and as a place for rearing fish. This is an ancient form of what is today called an "integrated farming system" or a "rice–fish system". Researchers note that the rice–fish system practised by the Apatani people of the eastern Himalayan region of India has been identified as a climate-resilience practice. Sangam *Marutham* records the same system in the Tamil land.

3.12 Welfare Indicators of an Agrarian Society

The *Vēṭkaippattu* ("Ten Poems of Desire") of Orampokiyar, which opens the *Marutham* section of *Ainkurunuru*, consists of prayers that the heroine and her confidante address to god. Together they list the welfare indicators of an agrarian society.

வாழி ஆதன் வாழி அவினி

நெல் பல பொலிக பொன் பெரிது சிறக்க

Long live Ātaṉ, long live Aviṉi!

May paddy flourish in plenty; may gold greatly abound.

— Ainkurunuru 1

The other poems of this decad extend to "*viḷaika vayalē varuka iravalar*" (may the fields yield; may suppliants come), "*pāl pala ūṟuka pakaṭu pala ciṟakka*" (may milk flow in plenty; may oxen thrive), "*paci illākuka piṇi cēṇ nīṅkuka*" (may hunger cease; may disease go far away) and "*māri vāykka vaḷam naṉi ciṟakka*" (may the rains come in season; may prosperity greatly increase). When these prayers are classified in today's language, many dimensions of sustainable agriculture emerge (Table 1).

Table 1. The prayers of the Vēṭkaippattu and present-day agricultural concepts

Prayer in the Vēṭkaippattu	Present-day agricultural concept
"May paddy flourish in plenty"; "may the fields yield"	Crop yield; food production
"May milk flow in plenty"; "may oxen thrive"	Livestock–crop integration; strength of draught oxen
"May the rains come in season"	Regularity of the monsoon; climatic stability
"May hunger cease"; "may disease go far away"	Food security; nutritional well-being
"May suppliants come"	Social sharing of surplus production

Here, "prosperity" is understood not as yield alone but as the combination of regular rain, livestock wealth, freedom from hunger and sharing. This differs from the Green Revolution view that measures production alone, and is closer to the multidimensional view of the Sustainable Development Goals.

3.13 A Literary Record of Productivity

Porunaratrupadai, which sings of Karikal Chola's Kaviri country, refers to land so fertile that a single *vēli* of land yields a thousand *kalam* of paddy:

சாலி நெல்லின் சிறை கொள் வேலி

ஆயிரம் விளையுட்டு ஆகக்

காவிரி புரக்கும் நாடு கிழவோனே

Lord of the land that the Kaviri nurtures,

where a single enclosed vēli of sāli paddy

yields a thousand measures.

— Porunaratrupadai 246–248

The phrase "*kāviri purakkum nāṭu*" (the land the Kaviri protects) is noteworthy here: it is not only the king who protects the country, but the river as well. This sense that water is the source of prosperity continues today among farmers of the Erode region, on the upper reaches of the Cauvery, in the saying "*āṟṟut taṇṇīr vantāl tāṉ payir*" ("only when river water comes is there a crop"). Bhavani Kooduthurai, where the Cauvery and the Bhavani meet, and the area where the Noyyal joins the Cauvery make Erode District the upper end of this "land of waters" (*puṉal nāṭu*).

4. Traditional Agricultural and Water-Management Knowledge of the Marutham Tiṇai

The agricultural knowledge of the *Marutham* people was based on the nature of the land, the fertility of the soil, the availability of water and the climate. They divided land into wetland (*nañcey*) and dry land (*puñcey*) and chose crops according to the character of soil and water. Nature-based methods such as repeated ploughing, levelling the land, and using livestock manure and green leaves were employed to maintain soil fertility. Many crops – paddy, sugarcane, banana, ginger, turmeric and pulses – were grown according to conditions. Thiruvalluvar points to the importance of preparing the soil well during ploughing:

தொடிப்புழுதி கஃசா உணக்கின் பிடித்தெருவும்

வேண்டாது சாலப் படும்

If the ploughed earth is dried till a measure shrinks to a quarter,

the crop will flourish without even a handful of manure.

— Thirukkural 1037

This couplet may be regarded as important literary evidence revealing the Tamils' insight into soil preparation and methods of ploughing.

4.1 Water and Land: Traditional Water-Management Knowledge

The basis of *Marutham* agriculture is the integration of water and land. There was a tradition of creating water bodies such as rivers, tanks, ponds, canals and check dams, storing water and supplying it to the fields as needed. Techniques such as impounding water and releasing surplus water through structures like sluices (*matakku*), surplus weirs (*kaliṅkal*) and outlets (*tūmpu*) were also used. A *Purananuru* poem states this very clearly:

உண்டி முதற்றே உணவின் பிண்டம்

உணவெனப் படுவது நிலத்தொடு நீரே

நீரும் நிலமும் புணரியோர் ஈண்டு

உடம்பும் உயிரும் படைத்திசினோரே

The body built of food depends on food;

what is called food is land together with water;

those who here have joined water with land

have created both body and life.

— Purananuru 18

The idea that those who unite land and water are the creators of life and food conveys the fundamental need for water management in agriculture. In the same poem:

வித்தி வான் நோக்கும் புன்புலம் கண்ணகன்

வைப்பிற்று ஆயினும் நண்ணி ஆளும்

இறைவன் தாட்கு உதவாதே

The dry land that, once sown, looks up to the sky,

however wide its expanse,

is of no help to the king who rules it.

— Purananuru 18

Here the vulnerability of rain-fed dry land is pointed out. As the remedy, the poem says:

நிலன் நெளி மருங்கில் நீர்நிலை பெருகத்

தட்டோர் அம்ம இவண் தட்டோரே

தள்ளாதோர் இவண் தள்ளாதோரே

Those who raised bunds so that pools would swell in the hollows of the land

are, indeed, the ones who have bound lasting fame here;

those who did not will not endure here.

— Purananuru 18

The social responsibility of those who enlarge water bodies according to the natural lie of the land is thus emphasised. From this we learn that storing water according to the land, reducing dependence on rain and sharing water for the common good were key elements of the Tamils' traditional water-management knowledge.

4.2 Climate Knowledge and Crop Choice

Agricultural activity was closely linked with knowledge of the seasons. The year was divided into *kār*, *kūtir*, *muṉpaṉi*, *piṉpaṉi*, *iḷavēṉil* and *mutuvēṉil*, and the time of cultivation was decided by observing natural changes such as rain, wind and temperature. Choosing drought-tolerant crops such as *tiṉai* (foxtail millet), *cāmai* (little millet) and *varaku* (kodo millet) when rain was scarce, and crops such as paddy in water-rich areas, shows agricultural knowledge adapted to the environment.

4.3 The Kongu Region and Continuity with Erode

Although *Marutham* in Sangam literature is mostly associated with the fertile fields of the Chola country, archaeological evidence shows that riverside, agricultural and settled ways of life also existed in the Kongu region. In particular, the excavation site of Kodumanal demonstrates the ancient settlement and craft development of Kongunadu. In *Patirruppattu*,

கொடுமணம் பட்ட வினைமாண் அருங்கலம்

... the rare jewels of fine workmanship made at Koṭumaṇam ...

— Patirruppattu 67

the "Koṭumaṇam" mentioned here is identified with Kodumanal. On this basis, the land knowledge, soil management, water storage, climate knowledge and crop choice of *Marutham* are not only ancient Tamil agricultural practices but also traditional ecological knowledge that can be studied comparatively with the Cauvery–Kalingarayan irrigated areas, the Noyyal river areas and the rain-fed lands of present-day Erode District.

5. Climate Resilience of the Marutham Tiṇai

The agrarian life of the *Marutham* people was adapted to natural challenges such as rainfall variability, drought and flood. Water-management methods – storing rainwater in tanks, ponds and wells, distributing water through canals and draining excess water – helped them cope with both drought and flood. Likewise, cultivating not only paddy but also pulses and millets, and conserving local seeds, were crop-diversification strategies that reduced yield losses. *Purananuru* clearly records the excellence of such water-management knowledge:

நிலன் நெளி மருங்கில் நீர்நிலை பெருகத்

தட்டோர் அம்ம இவண் தட்டோரே

தள்ளாதோர் இவண் தள்ளாதோரே

Those who raised bunds so that pools would swell in the hollows of the land

are, indeed, the ones who have bound lasting fame here;

those who did not will not endure here.

— Purananuru 18

The poem conveys that creating water bodies according to the natural lie of the land and storing water is necessary for the long-term livelihood of society. Further, the phrase

வித்தி வான் நோக்கும் புன்புலம் …

... the dry land that, once sown, looks up to the sky ...

— Purananuru 18

points to the vulnerability of agriculture that depends on rain alone, and thereby to the need for water storage and alternative water sources.

5.1 Climate Resilience of the Marutham Areas of Erode District

In present-day Erode District, too, wetland agricultural areas dependent on the Cauvery, Bhavani and Noyyal rivers are found alongside rain-fed dry lands that must cope with drought. Irrigation systems such as the Bhavanisagar dam, the Kalingarayan canal and the Thadapalli–Arakkankottai canals reveal the continuity of water management. In this setting, water storage, economical use of irrigation water, crop diversity and the conservation of local seeds become key elements of climate adaptation.

Relating the agricultural knowledge of the Sangam *Marutham tiṇai* to the agricultural environment of present-day Erode District is not a mere comparison of past and present; it is a research approach that identifies ecological knowledge that has endured. Elements of knowledge recorded in Sangam literature – water management suited to the land, reduced dependence on rain, crop diversity and the use of local resources – regain relevance in today's context of climate change. By comparing these elements with Erode's diversity of wet and dry lands and its irrigation systems, it is possible to show how the traditional ecological knowledge of the Sangam *Marutham* landscape has changed and how some of its elements continue to be used. In this sense, the climate resilience of the *Marutham tiṇai* is not merely a part of past agricultural history but also an important historical and ecological foundation for understanding sustainable agriculture and climate adaptation in present-day Erode District.



Figure 3. The irrigation system of the Erode region: rivers, dams, canals and irrigated areas (schematic, not to scale; labels in Tamil)

Figure 3 explains the irrigation system of the Erode region. It maps the main water-resource structures – the Bhavanisagar dam, the Bhavani, Cauvery and Noyyal rivers, and the Kalingarayan anicut and canal – together with the areas they irrigate.

6. Agriculture in Erode District Today

6.1 Current Agricultural Practices

In Erode District today, intensively irrigated commercial cropping (largely monocropping) and modern techniques such as drip irrigation are widely practised.

6.2 Traditional Agricultural Knowledge of Erode District

Knowledge of local seeds

- **Erode local turmeric:** a local variety with a high curcumin content and good disease resistance.
- **Traditional paddy:** Kichadi Samba and Seeraga Samba (irrigated areas), and Poongar and Karuppu Kavuni (drought-tolerant varieties).
- **Millets:** seeds of ragi (finger millet), *tiṉai* (foxtail millet) and *cāmai* (little millet) conserved in the Bargur and Thalavadi hills.

Traditional ploughing and the use of natural manure

Retaining soil moisture through summer ploughing; supplying natural nitrogen compounds to the soil through farmyard manure and the penning of sheep and goats on fields (*āṭṭukkiṭai*).

Traditional methods of pest control

- **Herbal pest repellents:** natural repellents made from neem seed kernel extract, *nocci* (*Vitex negundo*), tobacco and *erukku* (*Calotropis*).
- **Biological control:** the use of light traps and yellow sticky traps.

6.3 Climate Change and Agriculture in Erode District

Impacts of climate change

- Changes in rainfall, such as untimely monsoons and heavy rain within short periods, lead to falling groundwater levels and water scarcity.
- Drought lowers the water level of the Bhavanisagar dam, and a rotational "turn system" of supplying water through the irrigation canals is enforced.
- Rising temperatures increase evapotranspiration from crops, and pest attacks also multiply.
- As a result of changes in rainfall and temperature, yields of major crops such as turmeric and paddy are declining, and crop diseases are appearing in new forms.

6.4 Climate-Resilience Strategies of Agriculture in Erode District

1. Water conservation and efficient irrigation techniques. To cope with declining rainfall and water scarcity, water-saving irrigation methods such as drip irrigation and sprinkler irrigation are used. In crops with high water requirements, such as turmeric and sugarcane, these methods help to improve water-use efficiency. Rainwater is also harvested in farm ponds to meet part of the irrigation requirement.

2. Crop change and crop diversification. To meet climatic challenges such as water scarcity and failed monsoons, choosing crops with low water requirements – millets, sesame and pulses – in place of water-intensive paddy is an adaptation strategy. In addition, growing intercrops such as cocoa, pepper and fodder grass in coconut groves makes varied use of the land and diversifies farmers' sources of income.

3. Organic farming and soil conservation. By following organic farming methods, soil organic carbon can be improved and the water-holding capacity of the soil increased. In Erode District, organic farming initiatives in the tradition of Nammalvar and farmers' collectives contribute to spreading such alternative approaches, integrating soil conservation, water economy and agricultural adaptation to climate change.

7. Sangam Marutham and Present-Day Erode Agriculture: A Comparison

When the agricultural knowledge of *Marutham* recorded in Sangam literature is compared with the agricultural practices of present-day Erode District, it can be seen that some traditional knowledge continues, some has changed because of modernisation, and some practices are gradually disappearing.

7.1 Traditional Knowledge That Continues

Some elements of traditional agricultural practice continue today, such as summer ploughing, improving soil fertility by penning sheep and goats, and storing water for irrigation. In particular, historic irrigation structures such as the Kalingarayan canal remain important to the agricultural life of Erode District. These reveal the continuity of the integrated water–soil–agriculture knowledge of *Marutham*.

7.2 Agricultural Knowledge That Has Changed

Compared with traditional natural manures and biological methods of soil conservation, the use of chemical fertilisers and pesticides has increased in modern agriculture. Likewise, traditional ploughing with the wooden plough has declined, and mechanised methods, including tractors, have become widespread. Although this has increased the speed of ploughing and productivity, some elements of traditional agricultural knowledge have fallen out of use.

7.3 Traditions That Are Disappearing

Local knowledge such as traditional seed selection, seed saving and choosing seeds to suit the season is gradually declining, and dependence on commercial market seeds is increasing. In addition, the *kuṭimarāmattu* practice of maintaining tanks and ponds with people's participation has weakened in many places, affecting the continuity of community-based water-management knowledge.

7.4 Opportunities for Present-Day Use

The basic knowledge revealed by the Sangam *Marutham tiṇai* – "choosing crops to suit the land", "using water economically" and "protecting soil fertility" – can be integrated with today's scientific agricultural methods. Such an approach reduces heavy dependence on chemical inputs and creates opportunities to move towards sustainable agriculture that conserves resources and is resilient to climate change.

8. Applying Sangam Knowledge to Sustainable Agriculture

8.1 Preserving Traditional Knowledge

It is necessary to document systematically the knowledge recorded in Sangam literature – of agriculture, soil fertility, water management, seasonal awareness and seed selection – together with the experiential knowledge

still found among elderly local farmers. Recording this knowledge and passing it to the next generation will help the continuity of traditional agricultural knowledge.

8.2 Integrating Traditional and Modern Knowledge

The local seeds, natural manuring, soil conservation and water-storage methods used in the Sangam age can be integrated with modern technologies such as drip irrigation, soil testing, weather forecasting and satellite-based monitoring. This makes it possible to create an agricultural model that combines the ecological relevance of traditional knowledge with the technological precision of modern science.

8.3 Opportunities for Meeting Climate Change

To cope with the droughts, heavy rains and temperature changes caused by climate change, it will be useful to identify and conserve traditional drought- and flood-tolerant paddy and other crop genetic resources suited to local conditions. Whether traditional paddy varieties such as Karuppu Kavuni and Poongar are suited to the specific soil, water and climate conditions of Erode District can be examined through fieldwork and scientific evaluation, and they can then be promoted more widely.

Likewise, protecting and desilting historic irrigation structures such as the Kalingarayan canal, and continuously monitoring water inflow and water quality, can be integrated with modern water-resource management. In this way, the integrated water–soil–agriculture–community approach seen in the Sangam *Marutham* landscape can be redesigned as an applied model for present-day sustainable agriculture.

8.4 Local Seasonal Forecasting Knowledge

Farmers of the Kongu region fix sowing times by the *paṭṭam* system based on the Tamil months. *Āṭippaṭṭam*, and the *Puraṭṭāci–Aippaci paṭṭam* linked to the north-east monsoon, are the most important. Biological signs such as ants moving their eggs to higher ground, the arrival of particular birds and the flowering of trees are also said to be used to forecast rain. This tradition descends from the signs of the skylark (*vāṉampāṭi*) and the planet Venus (*veḷḷi*) recorded in *Pattinappalai*.

9. Comparative Analysis: Sangam Knowledge, Erode Practice and Climate Resilience

Of the nine elements of knowledge, six continue in the Erode region with change, two continue directly, and one (water quality) has been severely degraded. The matrix in Table 2 is a preliminary assessment based on literary evidence and documented regional practices; the "status of continuity" column must be confirmed once field data have been added.

Table 2. Matrix of Sangam knowledge, local practice in Erode and climate-resilience outcomes

Element of knowledge	Sangam literary evidence	Local practice in Erode	Climate-resilience outcome	Status of continuity
Rain and seasonal signs	*Pattinappalai* 1–7 (Venus, skylark)	*Paṭṭam* system; biological signs of rain	Shifting the sowing time; early warning	Continues with change (reliability needs reassessment)
Creation of water bodies	*Purananuru* 18 ("those who raised bunds so pools would swell")	Kalingarayan and Kodiveri anicuts; tank restoration	Drought management; groundwater recharge	Continues

Element of knowledge	Sangam literary evidence	Local practice in Erode	Climate-resilience outcome	Status of continuity
Awareness of the vulnerability of rain dependence	*Purananuru* 18 ("dry land that, once sown, looks to the sky")	Low-water crops in rain-fed areas	Risk-aware crop choice	Continues
Soil knowledge and manuring	*Thirukkural* 1037–1038	Penning of flocks, farmyard manure, green manure	Water- and fertiliser-use efficiency; soil organic matter	Continues with change (reduced by chemical fertilisers)
Field–pond–tree–fish integration	*Kuruntokai* 8	Coconut and banana on bunds; some fish culture in farm ponds	Income diversification; better microclimate	Continues with change (greatly reduced)
Crop diversity	*Vēṭkaippattu*; *tiṇai mayakkam* (blending of landscapes)	Crop layers suited to water availability; millet–pulse intercropping	Lower risk of crop loss	Continues with change
Livestock–crop integration	*Ainkurunuru* ("may milk flow in plenty, may oxen thrive")	Korangadu; Kangeyam cattle	Fodder security in drought	Continues with change (Korangadu area shrinking)
Water quality ("sweet waters")	*Tolkappiyam*, *Akattiṇaiyiyal* 5	Pollution of the Kalingarayan and the Noyyal	Decline in water quality and soil fertility	Severely degraded
Community water management; state responsibility	*Purananuru* 35, 184	Canal turn system; farmers' associations; opposition to concrete lining	Resource sharing; sustainability	Continues with change

Three trends are clear. First, **structural knowledge** (anicuts, canals, water bodies) continues most strongly, because it survives in physical form and is maintained by state institutions. Second, **practice-based knowledge** (manuring, integrated farming, seasonal signs) has been largely eroded since the Green Revolution by chemical inputs and monocropping. Third, there is a **new challenge** that Sangam knowledge did not face: the degradation of water quality caused by industrialisation.

These trends appear differently in the three field conditions of Erode (Table 3).

Table 3. Field conditions in Erode and appropriate resilience strategies

Field condition	Sangam element that continues strongly	Main climate challenge	Appropriate resilience strategy
Water-rich (Kalingarayan, Cauvery)	Water body and canal infrastructure	Water pollution; dependence on monocropping	Restoring water quality; strengthening crop rotation
Moderate (Lower Bhavani)	Crop choice according to water availability	Uncertainty of reservoir levels	Fixing the *paṭṭam* on the basis of seasonal forecasts

Field condition	Sangam element that continues strongly	Main climate challenge	Appropriate resilience strategy
Drought-prone (Modakkurichi, Noyyal, Kangeyam)	Mixed cropping; livestock integration	Rainfall variability; falling groundwater	Millets, Korangadu, tank restoration

This comparison shows that the relationship between Sangam knowledge and Erode practice is not one of direct inheritance; rather, the same ecological principles find expression in different technological forms in different historical periods.



Figure 4. Integrating agricultural knowledge: the comparative matrix and the implementation cycle (infographic; labels in Tamil)

Figure 4 shows how literary knowledge, farmers' experience, soil testing and weather information are integrated. After similarities and differences are examined, the approach is implemented through a five-step cycle: local trial, selection of practice, application, monitoring and revision.

9.1 Traditional Knowledge and Climate Challenges

The Sangam tradition records different strategies for each of three challenges: drought, rainfall variability and water scarcity (Table 4).

Table 4. Climate challenges, Sangam strategies and present-day climate-resilient agriculture (CRA)

Climate challenge	Strategy in the Sangam tradition	Present-day CRA parallel	Relevance to the Erode field
Drought	Shifting from rain dependence to river dependence (*Pattinappalai*); enlarging water bodies (*Purananuru* 18)	Water-storage structures; groundwater recharge	Tank restoration; check dams; protecting earthen canals

Climate challenge	Strategy in the Sangam tradition	Present-day CRA parallel	Relevance to the Erode field
Rainfall variability	Seasonal signs; agricultural calendar of six seasons	Seasonal forecasting; shifting the sowing time	Combining the *paṭṭam* system with IMD forecasts
Water scarcity	Crops suited to the land (*tiṇai*); diversified cropping	Crop diversity; low-water crops	Millet–pulse intercropping; Korangadu

The global finding that adaptive capacity is greatest when Indigenous and local knowledge is combined with scientific knowledge applies here as well.

9.2 Limits of Traditional Knowledge

The tendency to romanticise traditional knowledge must be avoided. Researchers point to three significant limits. First, Sangam knowledge developed in a relatively stable climate; in today's rapid climate change, old signs may fail. Second, Sangam *Marutham* reflects a hierarchical society in which the labour of the cultivator and the wealth of the landowner were separate; today's resilience strategies must benefit everyone equally, including small, marginal and women farmers. Third, traditional knowledge offers no direct solution to new challenges such as industrial pollution; yet the valuation of water as "*tīmpuṉal*" (sweet water) provides a discursive basis for making water quality a cultural value.

9.3 Implications for Farmers and Local Communities

Restoring integrated farming: combining fish culture in farm ponds, bund trees and livestock as the present-day form of the field–pond–tree–fish system shown in *Kuruntokai* 8.

Retaining traditions such as penning and farmyard manure: combining the principles of soil management emphasised in *Thirukkural* 1037–1038 with fertiliser management based on soil testing.

A community register of seasonal signs: participatory research that records the rain signs used by elderly farmers in each village and verifies them against meteorological data.

10. Conclusion

In Sangam literature, the *Marutham tiṇai* does not denote a fertile landscape alone; it reveals a complete ecological way of life in which soil, water, climate, crops, livestock, occupation, settlement and people's lives are all interconnected. Ploughing, animal husbandry, the use of water bodies, crop choice and agricultural practices adapted to the seasons show the *Marutham* people's life in harmony with nature and their climate resilience.

Many elements of this *Marutham* knowledge continue, in altered form, in the agricultural and rural life of present-day Erode District. Cauvery–Bhavani river irrigation; irrigation systems such as the Kalingarayan and Lower Bhavani canals; water management based on tanks, wells and canals; and practices such as the *paṭṭam* system, penning, Korangadu and millet–pulse intercropping show that the traditional knowledge of *Marutham* remains relevant today. These are local knowledge elements that strengthen climate resilience by protecting soil fertility, using water economically, coping with drought and reducing crop loss.

The agricultural knowledge of the Sangam *Marutham tiṇai* should not be regarded as a mere historical record. It may be regarded as traditional ecological knowledge that can guide water management, crop choice suited to the land, diversified agriculture, soil conservation and adaptation to climate change in present-day Erode District. At

the same time, contemporary challenges – the degradation of water bodies, declining water quality, rainfall variability and land-use change – threaten this continuity.

Therefore, rather than reviving the knowledge of the *Marutham tiṇai* as it was, the appropriate approach for a sustainable future is to apply its basic principles in combination with today's science, technology and local knowledge. The relationship that the Sangam *Marutham* people forged with nature and the agrarian life of the people of present-day Erode District together point to one truth: protecting land and water is not only protecting agriculture; it is protecting livelihoods, the living environment and future generations.

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Use of Artificial Intelligence Tools

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