



# AL-SHODHANA

*A Multi Disciplinary Refereed Research Journal*

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**St Aloysius College (Autonomous), Mangaluru, Karnataka**

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# Principal's Message

Engaging in research to understand and find new pathways leads to alternative ways of approaching the present realities of the society. Invariable manifestation and praxis have to be part of all the higher learning institutions and play a major role in shaping the society. They have an exceptional competence to build up skills and cultivate knowledge, and the potential to gather together learning resources. These institutions offer learning opportunities for varied populations and engage the learners in the present context to show the path for the future generations. Higher education institutions must help the students aware of the inequalities of the present structure rather than helping the students to fit into to the existing world order.

Questioning the existing inequalities and instilling critical thinking to foster the value systems strongly embedded in the culture is the need of the hour. The quality of higher education decides the quality of human resources in a country. We need to constantly churn the minds and ideas to see the realities and provide alternative space in the education systems of today. When we engage and deepen the search it leads us to depth and creative ways of approaching the realities, this in turn will open newer pathways for a better society where justice, liberty and equality prevails.

Al-Shodhana, the research journal of St. Aloysius College (Autonomous), is an attempt to share the research output of renowned learned scholars in the form of articles across disciplines triggering and fostering new knowledge.

I congratulate the editorial team for bringing out this edition of Al-Shodhana and wish that these research articles help you engage in deeper search and help us to understand the realities in an enlightened and informed manner.

**Rev. Dr. Praveen Martis S J**  
**Principal, St Aloysius College(Autonomous), Mangaluru.**

# Editorial

Like an untold story, an unwritten poem or an unfinished portrait, research is a magical discourse that always fascinates adherents. The researcher is like a dream merchant. The one who can dream the most earnest dreams and sell them well will forever remain in the hearts of the people. One becomes a researcher when they become aware of their own imperfections. The other becomes a permissive person when they try to embrace imperfection without any hesitation. The story of the two pots should be remembered in this context. A farmer had two pots. One was absolutely perfect with no leak, and the other was defective with a small crack, thereby leaking. Every day the farmer drew water from a pond a short distance away in the two pots to irrigate his crops. When the water was brought, only some water was available from the pot which had a crack over it and the rest would have leaked out. At the height of this sense of inferiority and negativity, the cracked pot asked the farmer, "Why don't you stop me from using again and again? I can carry only a little water than you think". The farmer replied, "Look at the path we came through. Don't you see that all the plants, shrubs and herbs on that side of the path are green, some with flowers and fruits that were nourished with the drops of water falling from your cracks? Whereas on the other side of the path, all the pavements on the side of the pitcher, without even a single crack, without a single drop of water leaking, are dry without even a blade of green grass. Therefore, I keep using you because, from your imperfections, others try to make themselves perfect. If nothing spills out of you, you will be of no use to others". The story reminds us that just like the cracked pot, a researcher and his research outputs become highly relevant.

The current issue of our journal offers six dynamic research papers across the discipline. The paper 'Malabar Language in Greek Drama: Poxy413 and Early Indo-Roman Maritime Commerce' by Dr. Joseph Koyippally Joseph, deals with Poxy 413, a Second Century AD papyrus document found from Oxyrhynchus in Egypt in 1903 has a play later called Charition, which contains a few lines that are speculated to be a transliteration of an Indian language of that time. The article attempts to argue that Charition is the first documentation of a Malabar language in Egypt and that more studies are necessary on this document to understand the historical evolution of language, considering the different phonetic spectrums of Greek and Dravidian languages.

The paper 'Institutional Interventions and Economic Viability of Natural Rubber Cultivation in Kerala' by Dr. Vipin Chandran K P, Dr. Sandhya P and Syam Santhosh is about the production of natural rubber, which is influenced by many parameters



like soil fertility, humidity, etc. The government has implemented various schemes to protect small rubber cultivators and increase agricultural production, such as improved access to credit and insurance schemes, increased public investment in agricultural research and extension services, and enhanced marketing and infrastructure. The present study concludes that interventions at the institutional, governmental and inter-governmental levels are needed to address the issues of rubber farmers in Kerala, to ensure the livelihood of the rubber cultivators and increase the production of rubber.

Dr. Asha Abraham, D'Souza Serena, Prasanna RS, Ganesh Hegde and Vruddhi, M through their paper 'CosciumFenestratum Stem Extracts Inhibits Lipogenesis In Differentiating 3t3-L1 Cell Lines In Vitro' explain methanolic extracts of Cosciumfenestratum stems show a dose-dependent reduction of triglycerides and cholesteryl oleate in differentiating 3T3-L1 cell lines. The phytochemicals present, particularly the alkaloid berberine and carotenoids detected in the extracts, could play a significant role. The authors claim that this is the first report on the anti-adipogenic property of Cosciumfenestratum and can further be tested for the development of anti-obesity drugs.

Mr. Alen Joshy, in his article 'Revisiting the Prebisch-Singer Thesis: A Study of Terms of Trade and GDP in the Pre and Post-Liberalisation India', examines the current relevance of Prebisch Singer thesis when considering the evolution of global value chains and the new requirements of competitiveness.

'Reflections on the Performance of Regional Rural Banks (RRBS) and the Need for Their Revitalization on the Lines of Enhanced Access and Service Excellence (EASE)', by Dr. Pradeep Kumar B, explain how the Government of India has started attempts to reform the RRBs with EASE being introduced to revitalize the RRBs in tune with technological changes and customer requirements, RRBs may be able to retain their position as the frontrunner of rural institutional finance in India.

Ms. Bhavanamol R has provided a historical account of disability in different phases through her article 'Historicizing Disability: A Marginalisation Context'. This study attempts to give an introduction to the historical patterns of the term 'disability' by adopting the method of narrative overview.

I sincerely thank the Principal of St. Aloysius College (Autonomous), Rev Dr. Praveen Martis SJ, for his persistent support. I'd like to thank all the contributors, reviewers and all the members of the editorial board for their cooperation in publishing this issue.

**Dr P P Sajimon**  
**Editor-in-Chief**

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# MALABAR LANGUAGE IN GREEK DRAMA: POXY413 AND EARLY INDO-ROMAN MARITIME COMMERCE

Joseph Koyippally Joseph

## Abstract

*Poxy 413, a Second Century AD papyrus document found from Oxyrhynchus in Egypt in 1903 has a play later called Charition which contains a few lines that are speculated to be a transliteration of an Indian language of that time. Following the German philologist Eugene Hultsch's proposal that it could be a South Indian language, probably Canarese, many scholars have attempted to identify this language as Kannada, Tulu, Tamil, Malayalam etc. and some have strongly argued that it is a only a fictional language. Nevertheless, some of its words are remarkably similar to the Dravidian languages, and also Sanskrit, suggesting that it is probably a Dravidian language which is influenced by Sanskrit. Kannada, Tulu and Malayalam are the dominant languages in the Malabar coast, where Roman and Arab ships landed for Monsoon-driven maritime trade around the time when Pox 413 was composed. Malabar, which extends from Gokarna to Kanyakumari and showcases a gradient shift from Kannada to Tamil through Tulu and Malayalam, could be the Indian location of the play. The article attempts to argue that Charition is the first documentation of a Malabar language in Egypt and that more studies are necessary on this document to understand the historical evolution of language, considering the different phonetic spectrum of Greek and Dravidian languages.*

**Keywords:** Charition, Languages, Phonetic Spectrum, Papyrus, Pox413, Evolution.

## Introduction

The 22.9 x 42.3 cm. second century Greek papyrus (Pox 413), unearthed from the papyri rubbish dump at Oxyrhynchus in Egypt in 1902, had the text of 'Charition mime', which burlesqued Euripides's Iphigenia in Tauris, and contained a passage in an 'Indian language' written in Greek. The debate whether its Indian characters speak an actual or fictional Indian language and if so, which language it is, and whether its staging in Roman Egypt involved authors / actors conversant in that language is not concluded yet. The text, now preserved at the Bodleian Library as Ms. Gr. Class. b 4 (P), suggests the presence of Indians in Egypt, which given the evidence from Roman trade and explorations.

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Documents such as Tabula Peutingeriana, and Periplus Maris Erythraei and archaeological evidence support this. The unsolved problem of the 'Indian' language of Charition (Tsitsiridis 202. fn. 47) requires more attention. This study tries to look at the various and often contradictory identification of the 'Indian language' in it.

Poxy 413 was discovered in 1896, when the British archaeologists Bernard Pyne Grenfell (1869-1926) and Arthur Surridge Hunt (1871-1934). Passages from the Bible and classical Greek works of Euripides, Sapho, Pindar, Sophocles were among the thousands of Greek personal and official documents they unearthed. The "literary composition of an unusual type" titled "413. Farce and Mime" appeared in the third annual volume (1903) known as The Oxyrhynchus Papyri. Hunt and Grenfell described this four-column papyrus document written on both sides as follows:

On the recto are three columns, of which the two latter are almost complete of a low comedy or farce, written in a good, sized semi uncial hand, the dramatis personae being carefully distinguished and stage directions added. Adhering to the right of the third column about halfway down is an un inscribed fragment of some size, showing that the work did not extend beyond half a column more at most. On the verso are firstly two columns in a much smaller and more cursive hand, preceded by a few letters of a third upon the projecting fragment already referred to, from what may be described as a mine, which is mainly at the least a monologue. The second of the two complete columns is shorter than thither and there are some 6 centimetres of blank space below it. Secondly, adjoining this to the right is another column of dialogue in the style of the recto, and with the same characters written in a somewhat larger and more careful hand, but evidently by the same person who was responsible for the foregoing mime. This column was intended to supersede the latter portion of the first column of the recto. (41).

Written in koine Greek in two different hands, it contained two mimes which were later named after their main characters, Charition and Moicheutria (Crusius). The 88-line Moicheutria appears in three columns on the front as ll. 1-7, 8-53, and 54-88. This play is about a lady plotting to poison her old husband and a



faithful old slave. Crusius called it *Moicheutria* ('The Adulteress') and Wiemken called it *Giftmischermimus* ('Poisoner mime'). The 106-lines of *Charition* appeared on the back in three columns as ll.1-36, 38-73, and 74-106. The fourth column of the front repeated its lines 30-57. Probably, the text on the back was a musician's copy and that on the front was an actor's copy. The text could be part of the repertoire of a travelling troupe of actors who performed in the Roman Empire. This is supported by the finding of the remains of a large theatre near this papyri dump site.

As the play is set on a coastal country on the Indian Ocean, it is presumed to be an Indian language. The words *Indas Pelagos* (Indian Ocean l. 88-91), *Indon Promoi* (Indian chiefs l. 90) and [*Parolios/Paralion*] (seashore) suggest that a country on India's costal region is the site of the events.

The lack of space between words in the passages makes the identification difficult "The speeches in the barbarian language are usually written continuously, like the Greek, without separation of words; but in one passage (ll.61-4) the words are divided by points". This could probably because the one who copied *Poxy413* from its original was unfamiliar with the Indian language it represented, Grenfell and Hunt initially thought that "The language is no doubt to a large extent of an imaginary nature, but it may include some genuine non-Hellenic elements..." (43). Later, commenting on lines 35, 83, and 205 they thought that it could be either Pali or old Prakrit:

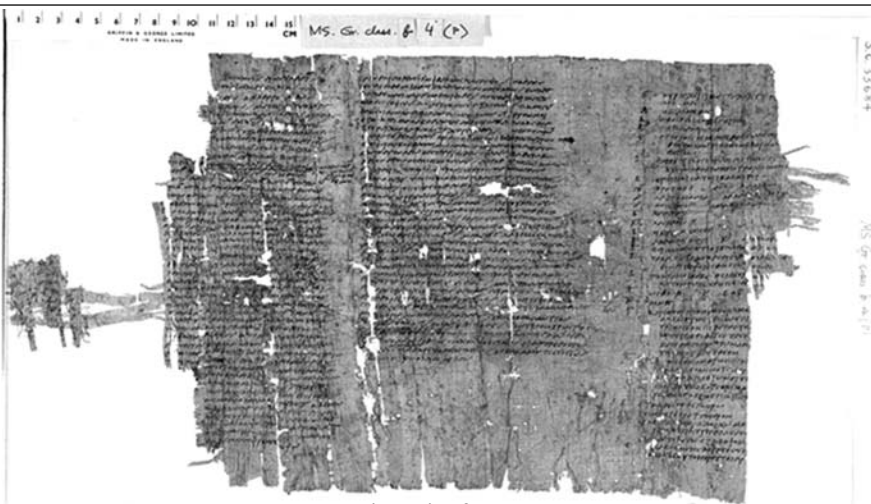
Assuming that it is worthwhile to attempt to bring the barbarian language in this piece into relation with any known speech, the key is possibly to be found in late Pali or old Prakrit. We owe to Dr GA Grieson the suggestion that in the present passage for instance, *πανουμβρητι* may represent *panoamruta*, 'drink' (or 'life') and 'nectar,' which suits the context remarkably well. Similarly he would connect *αλεμ(μ)ακα* in ll. 35 and 205 with Pali *alam* 'enough.' 'stop,' -ka being a substantial suffix which an ignorant Greek might use incorrectly. But we must leave the consideration to Sanskrit scholars. (55)

Photograph of the Papyrus Document POxy 413. Date unknown.  
From the Photographic Archive of Papyri in the Cairo Museum.



Verso (Front) of POxy 413

Source: <http://ipap.csad.ox.ac.uk/POxy-bw/72dpi/P.Oxy.III.413v.jpg>



Recto (Back) of POxy 413

Source: <http://ipap.csad.ox.ac.uk/POxy-bw/300dpi/P.Oxy.III.413r.jpg>

*Charition* is conspicuous for its non-Greek passage written in Greek transliteration. The following are those lines from the text, with () indicating stage directions, and ... indicating missing text.

### The 'Indian' words in *Charition*

Woman A: <i>kraunou</i> .	Barb. B: <i>tougoummi. ()nekelekethro.</i>
Woman B: <i>lalle</i>	Barb. A: <i>eitoubelletra choupteragoumi.</i>
Woman C: <i>laitaliana lalle ab ...aigm ...</i>	...
Woman D: <i>kotakos anab ...iosara</i>	Barb. B: <i>trachountermana.</i>
...	Barb. A: <i>Boullitikaloumbai platagoulda. ()</i>
Chorus: <i>laspathia.</i>	Bi...apuleukasar.()
...	King: <i>chorbonorbothorba...toumionaxizdespit</i>
Charition: <i>alemaka.</i>	<i>platagoulda. () Bi ...Seosarachis. ()</i>
...	<i>...orado. ()</i>
Chorus: <i>alemaka</i>	<i>Satur ...() ouamesaresumpsaradara. () ei. () ia.</i>
...	<i>() da ...</i>
Chorus: <i>Minei. ()</i>	Fool: <i>martha. () marithouma edmaimai.</i>
...	<i>() maitho . . . thamouna martha. ()</i>
King: <i>brathis.</i>	<i>marithouma. () ... tun ...</i>
Chorus: <i>brathis.</i>	King: <i>malpiniakouroukougoubi. ()</i>
...	<i>karako...ra.</i>
King: <i>stoukepairomellokoroke.</i>	Chorus: <i>aba.</i>
...	King: <i>zabede. ()</i>
King: <i>brathie.</i>	<i>zabiligidoumba.</i>
<i>bere konzei damun petrekio paktei</i>	Chorus: <i>aba oun ...</i>
<i>kortames bere ialero depomenzi</i>	King: <i>panoumbretikatemanouambretououeni.</i>
<i>petreiko damut kinze paxei zebe</i>	Chorus: <i>panoumbretikatemanouambretououeni.</i>
<i>lolo bia bradis kottos.</i>	<i>parakoumbretikatemanouambretououeni.</i>
Chorus: <i>kottos.</i>	<i>olusadizapardapiskoupiskateman</i>
...	<i>areiman . . . ridaou. () oupatei.a.</i>
King: <i>zopit.</i>	...
...	Chorus: <i>orkis ...</i>
King: <i>zeitsoukormosedede.</i>	
...	
Barb. A: <i>skalmakatabapteiragoumi.</i>	

### English Transliteration of the Greek version of the Indian passages in *Charition*

The date of its composition is uncertain and could be not much older than the papyrus itself—late first century or early second century. Several scholars have argued that the gibberish in Pox413 is an Indian language. Soon after its first publication, Eugene Hultsch, a German philologist who knew Sanskrit and Dravidian languages claimed it was ancient Kannada spoken in ancient South India. Regarding the barbarian language, Hultsch's suggestion that it may

wholly or partly an ancient Indian dialect is supported by some words which are used in Dravidian languages: *koncha* (Tamil: 'a little'), *patrakke* (Kannada: to a cup), *panam amruta* (Sanskrit: 'nectar drink') (see Page 337). In its updated version in *JRAS* he suggested that the place of its action could be "one of the numerous small ports on the western coast of India between Karwar and Mangalore" where "Konkani and Tulu besides Kanarese" are spoken:

The papyrus contains several words and sentences in Barbarian language. These I cannot make out (401). ... From the fact that the Indian language employed in the papyrus is Kanarese, it follows that the site of Charition's adventures is one of the numerous small ports on the western coast of India between Karwar and Mangalore. This territory now belongs to the districts of 'North Canara' and 'South Canara', the inhabitants of which speak Konkani and Tulu besides Kanarese, but which as may be concluded from the inscriptions discovered there, were formerly ruled by Kanarese princes. (401)

Oxyrhynchus ('sharp-nosed fish'), is a multicultural city of some 30,000 people near Memphis in the Roman province of Egypt. This city lying at some ten miles west of the Nile on Bahr Yussef, near Fayum Oasis in Upper Egypt, was on trade route that transported goods from India to Rome and it flourished between 400 BC and 350 A.D. as the regional capital of Pharaonic, Ptolemaic and Roman rulers. Pliny the Elder shows how the trade to Alexandria through the Nile took place, and how the Silk road passed through Oxyrhynchus. A 20<sup>th</sup> century excavation showed it had a 11,200-seat large amphitheatre which could entertain a third of the city. Egyptians, Jews, Cretans, Lycians, merchants, soldiers, mercenaries, peasants and manual labourers, artisans, lived in this strategic location between the ports of Berenike, Quseir al-Qadim and Myos Hormos. Goods from these Red Sea ports reached Oxyrhynchus to be sent across the desert to Quft to be shipped on the Nile to Alexandria. Ptolomy's *Geography*, the unknown Author's *Periplus*, and Strabo's *Geography*, and Pliny the Elder's *Natural History* testify that spice trade flourished between the Roman Empire and the south India during this period and through this route.

Greek had been so popular in Eastern Roman Empire since Alexander's invasion that Alexandrian Jews translated the Old Testament and Jewish Christians



composed New Testament in Greek during the time of the composition of *Charition*, when Latin-speaking Romans were controlling Aramaic-speaking Palestine. This Greek text must have been part of the repertoire of a travelling troupe of actors and was part of the 'Roman theatre' as the one found in Oxyrhynchus. Its Indian passage only underlines the multilingual community of Roman Egypt. At some time or the other, Greek used to write languages like Lydian, Phrygian, Thracian, Gaulish, Hebrew, Arabic, Old Ossetic, Albanian, Turkish, Aromanian, Gagauz, Surguch and Urum (Omniglot), just as many Muslims use Arabic to write local languages. This only emphasises that the transliterated foreign language could be real and familiar to the writer/actor/audience and create a sense of authenticity reflecting the linguistic diversity of multicultural Roman cities like Oxyrhynchus. It also helps to shed light on the cultural and historical context in which the play was written and performed.

Indian goods from Muziris (in Kerala), Barygaza (Baroch in Gujarat), and Kalyan (in Maharashtra) reached Myos Hormos, the prominent port on the Red Sea coast of Egypt and to Berenike, the southern-most Red Sea emporium in Ptolemaic and Roman Egypt through the ancient Indo-Roman trade route. South Indian presence there is well-attested (Gurukkal). Tamil-Brahmi texts and South Indian domestic pottery unearthed at Berenike suggest that South Indians had been living there (Bagnall and Rathbone 291). In his thirty second Discourse "To the People of Alexandria" (117 AD) Dio Chrysostom notes the regular presence

of "...a few Indians" who "make up the audience in your theatre and sit beside you on each occasion" (211). Strabo's *Geography* records how embassies from came "Pandion, or, according to others, Porus ... were sent to Augustus Caesar", and how an Indian immolated himself at Athens (XV:1). Inscriptions and documents related to Indian merchants found in Egypt prove the ties between India and Egypt (Salomon, Addenda; Salomon, Epigraphic Remains). Hultsch supports Prialux's theory that Indians had visited Augustus, Claudius, Trojan and Antonius Pius before 200 AD, and refers to *Periplus*, Ptolemy's *Geographia*; and to an Egyptian "registered as absent in India" during the time of Vespasian. To show that the commerce was reciprocal, he points to the ancient inscriptions by a 'wise Indian' in Redesiye temple near Berenike, to the Roman an astronomic textbook *Romala*

*Siddhantha* discovered in Sanskrit, and to the loads of Roman coins found in Malabar and Tamil Nadu, and (Hultzs, Remarks 402-404). Excavations at Thrissur, Coimbatore, Madura, and Cannanore have unearthed both pre-Augustan coins and those from the period of Augustus (27 BC-AD 14), Tiberius (14-17), Claudius (41-54), Nero (54-68), and Trajan (96-117) and others (Gurukkal 68). The Roman map *Tabula Peutingeriana* shows a temple of Augustus at Muziris at the mouth of River Periyar through which Yavana ships sailed bringing in gold and wine and sailing away with black pepper.

This and the Malayalam words found in *Charition* (Mani; UCLy) makes Muziris, the destination of Roman trade ships in the first Century AD also a candidate for the Indian country in *Charition*, and the language of that region a candidate for its Indian language. The country is marked by a river Psolichus (l. 40). It was the flood of 1341 that destroyed Muziris and redesigned the coastal region that ended the glory of Muziris and Chera dynasty which is referred to as Kerala Putra found in Ashokan Inscriptions and as 'Keprobotras' in *Periplus*; 'Kaelobotros' in Pliny and 'Kerobottros' in Ptolemy (Narayanan). *Charition* refers to the local king as βαρβάτω [προβαίνων 'Ινδῶν] (l. 89-91) "the first of India". This could be the reason why Hultzs thought that *Charition's* author or his informant must have been either a person from Karnataka living in Egypt, or a Greek who had been in Karnataka (Hultzs, Remarks 402-404).

*Charition* replays Euripides's theme of young woman protecting herself as virgin priestess, that is also found in Xenophon's *Romance of Antheia* in which the heroine takes refuge in a temple of Isis as her priestess not only saving herself from the Indian king Psammis and also enjoying his protection; in Euripides's *Helen* (412 BC) who is transported to Egypt becomes priestess of Isis till her husband comes and rescues her from the barbarian prince Theoklymenos; and in Euripides's *Iphigeneia in Tauris*. The parallelism between Euripides's plays *Iphigeneia*, *Charition* and *Helen* is obvious: Iphigeneia-Charition-Helen, Orestes-Charition's brother-Memlaus, Pylades/Chorus-Slave-Theonoe, King Thoas-Barbarian king-Theoclymenus, Artemis-Celine etc. *Charition* also shares the theme of journey into barbarian lands with Xenophon's *Anabasis*.

In *Iphigeneia in Tauris* Euripides tells the story of Agamemnon's daughter Iphigenia who is whisked away by Artemis from being sacrificed to by her father in preparation for the Trojan War. Artemis transports her to the land of the Taurians and Iphigeneia becomes priestess in the Taurian temple of Artemis and protects herself from king Thoas till her brother comes to save her. Taurians have a custom of sacrificing Greek men who come there. The play begins when Iphigeneia dreams that her brother Orestes is dead and prepares to mourn his death. Meanwhile, Taurians bring Orestes and Pylades to Iphigeneia to be sacrificed. They had come there to steal the wooden image of Artemis from the Taurian temple. The brother and sister recognize each other, and they plot their escape by duping the Taurians.

In all these, it is heroine who plots their escape from the captivity:

What route can I find  
to send you away from the city, away from slaughter  
back to your Argive home  
before the sword draws your blood?  
O hard-pressed soul, this is your task,  
to find some means.  
Shall it be by land, not by ship?  
But, trusting to flying feet,  
you will find your death, going through barbarous tribes  
and roads that are no roads; but through the narrow strait  
by the black rock is a far way  
for sea-borne escape. (*IT* 860-71)

Asking Orestes to use "an artful use of your infirmities" and make the locals' "piety serve their fear" Iphigenia declares that Orestes is unclean because of matricide and therefore unfit for sacrifice, and she needs to wash him and the defiled stature of the goddess in sea at the bay where the Greek ship is tethered. This is carried out with the connivance of the waiting women, and Artemis's "Consent with grace to abandon this barbaric land for Athens":

How can I  
escape the goddess and this tyrant, when he finds  
the marble base is empty, and the image gone?

Must I not then be killed? What could be my defense?  
But if it all can be done in one single act,  
if you can take both me and the image to the trim  
ship, then the chance makes it an honorable risk. (IT 973-80)

Besides the members of the chorus, *Charition* has seven Greek characters: The Greek characters include the central character a Greek girl Charition (A), her brother (Γ), Slave / Fool (B), and others in the Greek party that include Ship's Captain (Δ), Boatswain (ς), and two speakers of the Barbarian language identified as (ς) and (Z); and several native characters like the King (ΒΑΣ), Barbarian women (C, ΓΥΝ), and the All (ΚΟΙ). The play features some Greek and Indian characters in opposition. Charition is the captive priestess at the temple of Celine in a barbarian province on Indian coastline in *Charition*. Locals catch and bring her brother and his friend to be sacrificed. The Fool farts and drives the locals who plan to attack the leaderless Greeks to River Psolichus. Charition and her breather plot to make the barbarians drunk and escape. The local women who return from hunt exchange a few words and shoot an arrow at the Fool. The Fool farts again and makes them flee. B asks Charition to loot the temple, but she refuses. The locals return after a ritual bath in the river and the Greeks serve them strong wine. The drunk king sings, exhorts everyone to dance, and drunken, they all stagger and collapse. The siblings escape and order the boatswain to prepare the ship to leave. Charition prays the goddess for her blessings as they board the ship.

It could probably be more a pantomime than a mime. Mime originated in Dorian Greece and developed in Sicily and transformed into pantomime in the Roman period. Unless Greek mime used music more that earlier understood, it is certain that it is a pantomime. Mime gave way to the entertaining Roman theatrical form pantomime where a silent masked actor assisted by a choir and an orchestra played all the roles. Charition uses music, orchestra, singers and musical instruments. It could also be a performance outline (Wiemken) or a curtailed version of a fully-scripted play. It has metrical sections, choral responses, stage directions, sequences, and dialogues requiring actors to improvise (Hall, Inventing; Hall, Theatrical Cast; Hall, Singing Actors 4.fn 7).



What distinguishes *Charition* from the other plays is the presence of the Indian language transliterated in Greek. In *Celine*, the drunk Indians speak to their king (83-4) who then bursts into a Greek song leading the 'barbarian and immense chorus' to their goddess (88). His command to dance is echoed by Charition's brother (93) who signals the Fool to trip up the king and bind him fast with sacred girdles (93). With the Indians drunk and the king tied up, Charition who refuses to rob the temple reappear, prays to the goddess (96-106), and commands obedience from the barbarian women archers who appear with the command "*alemaka*" in their language (IT 124), and suggests the Fool and the ship's captain to escape fast. Although the only word she speaks in the language of the Indians is *alamaka*.

Linguistically, the use of Greek transliteration suggests the presence of a non-Greek language indicating a desire to represent the speech of characters who were non-Greek or to evoke a particular cultural or linguistic context, that was exotic, as India had been to the Romans. It is only in one of two ways that the unknown author of the Greek farce can have acquired his knowledge of Kanarese words and sentences. He owed them either to a native of a coast of Canara who resided in Egypt, or to a Greek who had learnt the vernacular during his stay (Hultzschi 401) in India. Rice speculated that Indian actors took part in its production and that "the long foreign passages, especially those of the King, were delivered by native Indians, who had been brought across the sea to Egypt; and that these parts were written in Greek, either because their own vernacular had not been reduced to writing or because they were illiterate in it. (Rice 221)

LD Barnett (1926) challenged Hultzschi's thesis since no Kannada examples were found in the second century AD, and because Tamil is older since the oldest text in Old Kannada is Kavirasa's ninth century a poetic treatise *Kavirajamarga* and because the older Sangam literature is also later than papyrus era:

Tamil, which in its ancient form is closely akin to Old Kanarese, possesses a corpus of poetry ascribed to Sangam or academy, for which much greater antiquity is claimed; but it is very doubtful whether this claim will bear critical investigation, and probably the Sangam literature, at least in its present form, is considerably later than our papyrus. Obviously

then we need to be very cautious in accepting as Kanarese any words in so early a text: if proposed reconstruction agrees with the rules of the oldest classical texts, we may admit it, but only provisionally and with reservations, and if on the other hand if it shows features of medieval or modern dialects, we must unhesitatingly reject it. This is our first criterion. The second is that interpretations must make good sense and be natural and unforced.; the third is that the interpreter shall not unduly alter the text. Judged by these criteria, most of Dr. Hultzsich's readings seem to me to be unconvincing. (Barnett 13)

However, LD Barnett (1926) challenged Hultzsich's thesis since no example of Kannada language can be found in the second century AD. Even they do not disagree with the Dravidian connection (Salomon 1991). The Defenders of Kannada theory include P Govinda Pai (1929), KB Ramakrishnayyah, Sama Sastri, and Bhaskar A Saletore. Shama Sastri transliterated and interpreted the passage in Kannada (Sastri). MH Krishna's discovery of the Halmidi Kannada inscription (450 AD) from Hassan in Karnataka in 1936 strengthened them. Sastri (1926) and Saletore (1936) compared the words with newly discovered epigraphic evidence. Varadpande reproduced the translations and discussed their differences (98-110). Although Cunningham criticised all these studies for lacking scholarly rigour (2002:358). Saletore supported Sastri (Saletore).

However, Saletore also rejects Pai's view that the location is the capital of Alupas, Udyavara (Odora in Greek). Varadpande (1981) identified Malpe, within Tulu Nâdu—a region that spreads across northern Kerala and southern Karnataka—as the Indian territory mentioned, based on the reading of the word '*malpe*' in the text. Rai wonders if the kingdom of the 'Alupas' a corruption of the 'Malupas' in Charition is. Instead, Saletore proposes Odabhandeshwara, a former Shaivite centre near Malpe. The sea-shore rock temple Rudrapadakshethra near Mangalore is a candidate (Keerti 2012: 26). Around the first century AD it is understood that the coastal region including Malpe was submerged and is not mentioned in the Greek works of Pliny and Ptolemy who record the port towns of *Oloikhora* (Alupe, east of Mangalore) and "Bacelore" (Basarur, east of Kundapur). That Prakrit, not Old Kannada, was the language of Karnataka, and one finds it in the Ashok edicts dating from 300 BC, adds to the reason that the language was not Kannada.

Whether it was a Dravidian or proto-Dravidian language, its identity is still unclear, despite several attempts. Similarly, Tulu became dominant from the 4th century AD after coexisting with Munda and Prakrit, the administrative language of the region. Many Tulu Nadu place names betray their Munda/Prakrit origin. The Tulu calendar year starts with the month of *Paggu*, name of a traditional Munda festival; and Tulu word for surname *bari* means house in Munda. (Mundkur and Vishwanatha).

Although many stray words are identified, two sentences require special attention are a) “*bere koncha madhu patrakke haki* (‘having poured a little wine into the cup separately’), and b) “*panam ber etti katti madhuvam ber ettuvunu* (‘having taken up the cup separately and having covered, I shall take wine separately’). Pai argues that the word *echousi* ‘e koosi’ is phonetically close to Kannada *koosu* ‘maid’. Similarly, if *kraunouis* Kannada *karevanauor* ‘Did he call?’, it makes A seeking clarification ‘did he call?’, from B who she thinks has called her ‘e koosi’, and getting the reply: *(I)jata (I)jantalalleor’aithaenthalalle*’ in Kannada meaning, ‘Isn’t she (heroine) calling us?’

It has to be understood that *Greek which does not have equivalents for Kannada phonemes must have modified South Indian words within the Greek phonetic spectrum, causing confusions. However, the Indian sounds they claim missing from Greek are also applicable to most of the Dravidian languages also. Govinda Pai supports the Kannada theory and interprets some Greek words as Kannada text: kraunou - karevano (shall I call?); lalle - alle (there itself); laitalianta lalle ab ... aigm - aita enta ille (she beckons us to come); alemaka - alla emma akka (Not me, sister); skalmakatabapteiragoumi - s kal-moka-ta-bap-teiragoumi (come bring embers carrying them); Seosarachis - seo-serachis (siva sarakhisu, help, Siva); ouamesaresumpsaradara - someswara (Someswara); malpiniakouroukougoubi .. karako - malpi-niakourou-kougoubi-karako (Call out and summon the Malpe chiefs). Others like Sastri, Saletore, and Hampa Nagarajaiah have also identified a few Old Kannada words in it<sup>2</sup>.*

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<sup>1</sup> ಚ (cha), ಛ (chha), ಜ (ja), ಝ (jha), ಞ (jna); ಟ (Ta), ಠ (Tha), ಡ (Da), ಢ (Dha), ಣ (Na); ಶ (sha), ಷ (shha), ಹ (ha), ಳ (lha)

<sup>2</sup>See [https://en.wikipedia.org/wiki/Talk:Charition\\_mime](https://en.wikipedia.org/wiki/Talk:Charition_mime)

Saletore rejects Pai's view that the location is the capital of Alupas, Udyavara (Odora in Greek). (Saletore), Varadpande (1981) identified Malpe, within Tulu Nâdu—a region that spreads across northern Kerala and southern Karnataka—as the Indian territory mentioned, based on the reading of the word '*malpe*' in the text. Rai wonders if the kingdom of the 'Alupas' a corruption of the 'Malupas' in Charition is. Instead, Saletore proposes Odabhandeshwara, a former Shaivite centre near Malpe.

P Shivaprasad Rai ((Rai)and UP Upadhyaya (1996) have suggested that the language could be Tulu. Although Rai's study was criticized for not following "scholarly standards" (Tsitsiridis 202 fn.47), scholars like Salomon (Salomon, Addenda), and Budhanand Shivalli (1982) endorse Rai's views. The Tulu words claimed to have been identified include: "*Malpiniak ourouk oukooubj*" and "*menai*."

Some also argue that it could be Tamil. In fact, Hultzsch's reading of Zopit *zopit* [l. 65] as *jhatiti* comes in the context of the king allowing his men to drink wine and Barnett's agreement with him (Barnett 13) sounds bookish than '*sappidu*' which in Tamil means 'eat/drink'. The Lexical connection between Tamil and Greek thanks to the Graeco-Roman and Dravidian commerce. Has been noted Tamil words like *earichi* (rice) ὄρυζα; *inchiver* (ginger) ζιγγίβερις; *santhu* (sandalwood) σανθάλι; *akil* (agarwood), ἀγᾶλοχον; *karuva* (cinnamon), καρπιον; *toddy* (local liquor), ταδι; *kozhi* (chicken), κόττος; *kindi* (a small vessel), *thachan* (mason), τεκτον; *arasan* (king), ἄρχων; *njarampu* (nerve), νεύρο; *neer* (water), νερό; *pala* (many), Πολλά; *pazhai* (old), παλαιός; *konam* (angle), γωνία, show the possible connection between the two.

Most Dravidian languages share these Sanskrit words *patr* (cup), *panam* (drink), *madhu* (wine) and Dravidian words *bere* (another) *etu* (take) etc., it is difficult to convincingly say that the language is Kannada or Tulu until the grammatical words in it are properly identified. Many stray words have been traced but so far only two sentences have been read (such words as *akka*, 'elder sister' in most of southern languages and *illai* 'no' in Tamil etc.) and these leave no doubt about their Dravidian origin. The seven major Dravidian languages are Telugu, Tamil, Kannada, Malayalam, Gondi, Kurukh, and Tulu.



Some also argue it to be Malayalam. Since the 6th century BC Achaemenid Empire used Aramaic as its language of diplomacy and trade, and that the Syrian Christians who came as traders to Kerala used it as their liturgical language, and since koine Greek had been the language of communication in the Mediterranean and towards the East since Alexander's invasion, Mani argues the Indian language in *Charition* is the language of the Syrian Christians of Kerala. He identifies 37 Sanskrit: *a (aa)*, *ai (ai)*, *alem (alem)*, *ambretou (amritho)*, *arminthi (aravinthi)*, *bere (bera, beram)*, *bratheis (vruthi)*, *brathis (vruthi)*, *breti (vratch)*, *da (da, dan)*, *danum (daman, damanan)*, *dara (dara)*, *ei (ei)*, *ekethro (ekatra)*, *esar (eswar, esan, easwara)*, *goumi, goummi (gama, gami, gaman)*, *ia (ia)*, *kormo (karma)*, *koroke (korak, korakam)*, *krouno (krayanam)*, *lalle (lalath)*, *las (las, lasa)*, *minei (minva, minvathi)*, *orkis (vakra)*, *ouam (om)*, *ouptei (upada)*, *panoum (paanam)*, *pathi (pathi)*, *petrekio (paatrika, paathram)*, *sara (sara)*, *slalam (skalan, skalanam)*, *stouke (stuka)*, *thamouna (tvan)*, *tou (tuam)*, *trachoun (thrag)*, *z (sa)*, and *zopit (sapithi, saappidu)*; 15 Malayalam: *aka (aaka)*, *akata (akattal, akattuka)*, *boulliti (vellathil)*, *edumai (edu, edukkuka)*, *ialero (iyalar)*, *kaloumbai (kolum)*, *konzie (kinchil, koncha)*, *kotako (kotaka)*, *kottos (koottu, koottuka)*, *maimai (mahima)*, *mana (mana)*, *sede (chey, cheythu)*, *ter (tkheruka, thettam, theral)*, *termana (thermana)*, *tun (thuma)*; 8 Hebrew: *Eisu (Jésus)*, *Esu(Jésus)*, *matha (Martha 2)*, *mari (Mariam)*, *thouma (Thomas 2)*; 3 Aramaic: *aba (abba2)*, *oun (oun)*; and 6 Greek words: *apiskopis (episcopos)*, *apuleukasar (apolou)*, *areiman (ierais)*, *bapteira (baptisma)*, *katemanou (katemeno)*, *tumion (thumion)*. He also speculates that the unidentified 32 words possibly belong to other Dravidian languages (Mani). Another study based on Mani's by the Research Chair on Eurasia identifies 37 Sanskrit, 13 Malayalam, 10 Aramaic, and 6 Greek words (UCLy). The far-fetched similarities in these studies are also compounded by the fact that Malayalam evolved from Tamil and Sanskrit only between the tenth and thirteenth centuries. Most Dravidian languages share vocabulary, grammar, and foreign loan words. Many of the words he identifies are Sanskrit, and it is doubtful if the influence of Sanskrit was so much on Dravidian languages of the time at the popular level. It is doubtful if a Malayalam-speaking Syrian Christian community existed in Kerala at the time of the composition of *Charition*. The Syrian Christian oral tradition brings the Syrian Christian trader Knai Thoma to

Kerala only sometime between 345 AD and 811 AD. Whether the earlier 'Thomas Christians' of Kerala had Sanskrit dominated Tamil with a sprinkling of Hebrew and Greek vocabulary as spoken language is highly improbable.

Any attempt to identify the 'Indian language' in *Charition* with a specific Dravidian language could be problematic since the language has evolved over time with mutual contact and as the people speaking these languages in this region have always been multilingual for historical and maritime reasons. Tulu, Kannada, Badaga, Toda, Kota, Kodagu, Irula, Tamil and Malayalam are only some of the major prominent languages spoken in this region. Tulu and Kannada is part of this multilingual and multicultural everyday reality even to this day. That even the city 'Mangalore' has several names in local languages: Kudla (Tulu), Kodial (Konkani), Kodeyaala (Havyaka), Maikala (Beary), Manjarun (Sanskrit), Mangalooru (Kannada), Mangalapuram (Malayalam) shows this diversity. The areas around Mangalore, suggested as the location of *Charition* are all part of Malabar, which extends from Gokarna in north Karnataka to Kanyakumari in south Tamil Nadu in the Dravidian linguistic area, with Kerala lying in between.

Whether Pox 413 is the whole text, performance outline, farce', 'music hall', and 'burlesque', 'mime' or 'pantomime' (Hall, Iphigenia), it is certainly an imitation of an earlier text in light vein, and the language it uses in transliteration for comic purposes is probably Dravidian. Whether it was the Old Kannada, Old Tamil, or Tulu of the Second Century, it is certain that those were spoken in Malabar during that period. There are no First or Second Century samples of any of these Malabar languages, they share vocabulary and syntax. Even though it is defective in many ways, this 'Indian language of *Charition*' is the first record of Malabar speech at around the time when Indo-Roman Trade was at its peak, and this could illuminate linguists on the development of the languages of the region.

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# INSTITUTIONAL INTERVENTIONS AND ECONOMIC VIABILITY OF NATURAL RUBBER CULTIVATION IN KERALA

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## Abstract

*Natural rubber production in Kerala has seen a decrease in the last decade, with a decrease of 492500 tonnes in 2019-20 from the 2009-10 figure of 745510 tonnes. The main cause for this reduction has been the low returns from cultivation. All districts in Kerala have seen a decrease in rubber productivity, with Alappuzha, Kottayam, Idukki, and Ernakulam showing a decrease of more than 40%. However, the production of natural rubber has increased in the north-eastern parts of the country, particularly in Tripura, Assam and Nagaland during 2019-20. The production of natural rubber is influenced by many parameters like soil fertility, meteorological factors and other factors. The government has implemented various schemes to protect small rubber cultivators and increase agricultural production, such as improved access to credit and insurance schemes, increased public investment in agricultural research and extension services, and improved marketing and infrastructure. The present study concludes that interventions at the institutional, governmental, and inter-governmental levels are needed to address the issues of rubber farmers in Kerala, to ensure the livelihood of the rubber cultivators and increase the production of rubber.*

**Keywords:** Natural rubber, Rubber board, Productivity, Institutional support

## Introduction

Kerala is one of the leading states in India in terms of rubber production. Kerala is the nearly monopolistic contributor to the natural rubber production of India with 90 percent of the total production and 78 percent of the area under cultivation in the country. In Kerala, around 40 per cent of the area as well as 45 percent of production of rubber comes from three districts; Kottayam, Ernakulam

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and Pathanamthitta and small holders contributed 92.5 percent to the total production. It is an important cash crop for the state and has had a profound influence on the economic and social life of people in Kerala.

Rubber is used for a variety of purposes, ranging from erasing pencil marks to manufacturing tyres and tubes, as well as a variety of industrial products. The presence of national institutes like the Rubber Research Institute of India and the Rubber Board in the state further reflects the growing demand of the importance of rubber cultivation in Kerala. In the past fifty years, there has been a sharp decline in the area under food crops and a significant expansion in the area under commercial crops, with rubber being the major cash crop. This has had a significant impact on the economy of the state.

The following objectives were concentrated for this study, that included to analyse the growth on area, production, and productivity of natural rubber cultivation in Kerala; to examine the institutional support for natural rubber cultivation in Kerala; and to find out the reasons for the low productivity of natural rubber in Kerala.

## **Materials and Methods**

The study is based on secondary data. Secondary data collected from Rubber Board, Farm Guide published by Farm Information Bureau and other sources. The data regarding area, production, and productivity of natural rubber in Kerala has been collected from the year 2009-10 and 2019-20. Statistical and econometric techniques were employed to analyse the data. Important tools for analysis are;

### **(i) Coppock Instability Index**

Instability was also analysed using Coppock Instability Index, which is calculated as the antilog of the square root of the logarithmic variance using the following formula.

$$\text{Coppock Instability Index} = \text{CII (\%)} = \text{Antilog } (\sqrt{\text{VLog}} - 1) \times 100$$

### **(ii) Growth rate**

Calculate growth rate with these steps:

Use growth rate formula: It is necessary to know the original value and divide the absolute change with it. The formula is  $\text{Growth rate} = \text{Absolute change} / \text{Previous value}$

Calculate the absolute change: Knowing the original value and the new value is essential for finding the absolute change. The formula is  $\text{Absolute change} = \text{New value} - \text{Previous value}$

Use the original value for dividing the absolute change: You can get growth rate by dividing the absolute change by the previous value. The formula is  $\text{Growth rate} = \text{Absolute change} / \text{Previous value}$  Find percent of change:

$\text{Formula of Percent of change} = \text{Growth rate} \times 100$

### **(iii) Productivity analysis**

Productivity measures the quantity of output produced with a given quantity of inputs or factors of production. Here the main factor of production is land. It means how much kg yield of natural rubber per 1 hectore area.

$\text{Productivity} = \text{Total production in k.g} / \text{total area of production} \times 1000$

## **Results and Discussion**

### **Area and Production under major Plantation crops in Kerala**

Kerala is one of the most agriculturally developed states in India, and plantation crops form an important component of the agricultural economy. Plantation crops are crops that are cultivated on large plantations, and are typically grown for commercial purposes. In Kerala, plantation crops such as rubber, tea coffee and cocoa are some of the most important sources of income for farmers. The table 1 provides information on the area under major plantation crops in Kerala in 2019-20. The table shows that rubber is the most widely grown crop in Kerala, with a total of 551,200 hectares being cultivated across the state. This is followed by coffee, with 85,880 hectares, tea, with 35,871 hectares, and Cocoa is the least widely grown crop, with 14,276 hectares being cultivated. Kottayam, Ernakulam and Pathanamthitta are the top three districts in terms of area under rubber plantations, with 114340 hectares, 60140 hectares and 50890 hectares respectively.

Table 1: Area Under Major Plantation Crops in Kerala (2019-20)

District	Plantation Crops		(Area in Hectares)	
	Rubber	Tea	Coffee	Cocoa
Thiruvananthapuram	32330	913	0	54
Kollam	37350	574	0	11
Pathanamthitta	50890	0	0	309
Alappuzha	4580	0	0	63
Kottayam	114340	0	0	889
Idukki	40570	25508	13240	9610
Ernakulam	60140	0	0	1092
Thrissur	15620	530	0	32
Palakkad	37870	788	4935	205
Malappuram	42765	0	0	74
Kozhikode	21930	0	0	847
Wayanad	10770	7558	67705	348
Kannur	48050	0	0	475
Kasaragod	33995	0	0	267
Total	551200	35871	85880	14276
Source: Farm Guide 2022, Government of Kerala.				

Overall, the table shows that rubber is the most important plantation crop in Kerala, followed by coffee and tea and also reveals the district wise distribution of the area under major plantation crops, which can be useful for policy makers to formulate appropriate strategies for developing the plantation sector in the state.

Table 2: Production Under Major Plantation Crops in Kerala (2019-20)

District	Plantation Crops		(Area in Hectares)	
	Rubber	Tea	Coffee	Cocoa
Thiruvananthapuram	30480	50	0	38
Kollam	37300	100	0	9
Pathanamthitta	49610	0	0	446
Alappuzha	3500	0	0	76
Kottayam	96400	0	0	872
Idukki	32800	43310	8223	13448
Ernakulam	50150	0	0	827
Thrissur	13800	1770	0	19
Palakkad	33800	2170	2560	200
Malappuram	39975	0	0	41
Kozhikode	22300	0	0	595
Wayanad	6200	11860	54676	295
Kannur	44820	0	0	303
Kasaragod	31365	0	0	156
Total	492500	59260	65459	17325
Source: Farm Guide 2022, Government of Kerala.				

Table 2 provided the picture of the production of major plantation crops in Kerala for 2019-20. Rubber is the major plantation crop in Kerala, with a total production of 492500 tonnes in 2019-20. Kerala has seen a steady growth in production of plantation crops over the years, due to its favourable climate and soil conditions. This has helped to increase the income of farmers in the state and has also contributed to the overall development of the state.

### Area of Natural Rubber cultivation in Kerala

Table 3 provides the growth rate of the area of natural rubber in each district for the years 2009-10 and 2019-20. Overall, the total area under natural rubber

cultivation in Kerala was 5.25 lakh hectares in 2009-10 and increased to 5.51 lakh hectares in 2019-20. The growth rate of the state is 4.9%. Kottayam district has the largest coverage of natural rubber cultivation in the state, followed by Palakkad and Malappuram districts. The trend analysis shows that there is a slight increase in the area under rubber cultivation during the period of 2019-2020. The increasing trend in the area of natural rubber in Kerala is a positive sign for the state as it will help to increase the production of natural rubber and improve the livelihood of the farmers in the state.

Table 3: District wise area of natural rubber in Kerala

Zones	Districts	Year (2009-10)		Year (2019-20)		Growth Rate
		Area (ha)	Contribution (%)	Area (ha)	Contribution (%)	
<b>South Zone</b>	Thiruvananthapuram	30449	5.80	32330	5.9	6.2
	Kollam	36111	6.87	37350	6.8	3.4
<b>Central Zone</b>	Pathanamthitta	49957	9.51	50890	9.2	1.9
	Alappuzha	4329	0.82	4580	0.8	5.8
<b>North Zone</b>	Kottayam	112918	21.49	114340	20.7	1.3
	Idukki	39679	7.55	40570	7.4	2.2
	Ernakulam	58729	11.18	60140	10.9	2.4
	Thrissur	15017	2.86	15620	2.8	4.0
	Palakkad	35559	6.77	37870	6.9	6.5
	Malappuram	38136	7.26	42765	7.8	12.1
	Kozhikode	20358	3.87	21930	4.0	7.7
	Wayanad	9723	1.85	10770	2.0	10.8
	Kannur	43819	8.34	48050	8.7	9.7
	Kasaragod	30624	5.83	33995	6.2	11.0
	Total	525408	100	551200	100	4.9
Source: Farm Guide 2022, Government of Kerala.						

## Production of Natural Rubber cultivation in Kerala

Table 4 shows the district-wise production of natural rubber in Kerala for the years 2009-10 and 2019-20. Overall, the district-wise production of natural rubber in Kerala and its corresponding growth rate indicate that production has decreased in all districts. The overall growth rate for natural rubber production in Kerala is -33.9%. This indicates that production of natural rubber in Kerala has decreased in all districts. This could be due to a variety of factors such as reduced demand for natural rubber, increased competition from synthetic rubber, or changes in the economic environment. It is important to understand the underlying causes in order to develop strategies to increase production and ensure the sustainability of the industry.

Table 4: District wise production of natural rubber in Kerala  
(Production in Tonnes)

Zones	Districts	Year (2009-10)		Year (2019-20)		Growth Rate
		Production (Tonnes)	Contribution (%)	Production (Tonnes)	Contribution (%)	
<b>South Zone</b>	Thiruvananthapuram	42900	5.8	30480	6.2	-29.0
	Kollam	50830	6.8	37300	7.6	-26.6
<b>Central Zone</b>	Pathanamthitta	77400	10.4	49610	10.1	-35.9
	Alappuzha	6580	0.9	3500	0.7	-46.8
	Kottayam	170800	22.9	96400	19.6	-43.6
	Idukki	54600	7.3	32800	6.7	-39.9
	Ernakulam	90770	12.2	50150	10.2	-44.8
<b>North Zone</b>	Thrissur	21800	2.9	13800	2.8	-36.7
	Palakkad	47930	6.4	33800	6.9	-29.5
	Malappuram	48080	6.4	39975	8.1	-16.9
	Kozhikode	28275	3.8	22300	4.5	-21.1
	Wayanad	8400	1.1	6200	1.3	-26.2
	Kannur	58125	7.8	44820	9.1	-22.9
	Kasaragod	39020	5.2	31365	6.4	-19.6
	<b>Total</b>	<b>745510</b>	<b>100</b>	<b>492500</b>	<b>100.0</b>	<b>-33.9</b>

Source: Farm Guide 2022, Government of Kerala.

## Productivity of Natural Rubber

Table 5 provides a snapshot of the natural rubber productivity growth rate of the three zones in India – South Zone, Central Zone, and North Zone - for the respective districts. The data has been presented in terms of the growth rate of natural rubber productivity in the respective districts. Overall, the total growth rate of natural rubber productivity in India is -37.0% and it is evident from the table that the natural rubber productivity in the three zones in Kerala has decreased.

The decrease in natural rubber productivity in the three zones in Kerala could be due to a number of reasons. One possible reason could be the decrease in the demand for natural rubber due to the increasing availability of synthetic rubbers. Another possible reason could be a decrease in the quality of the soil due to over-cultivation or climate change, which could have an adverse effect on the productivity of natural rubber. Additionally, the increased use of pesticides and chemical fertilizers could also be a contributing factor. To increase the productivity of natural rubber, farmers need to adopt sustainable and organic farming practices, and the government needs to provide financial assistance and incentives to the farmers. Only then can the productivity of natural rubber increase in Kerala.

Table 5: Productivity of Natural Rubber

Zones	Districts	Productivity (ink.g)(2010)	Productivity (ink.g) (2020)	Growth Rate
<b>South Zone</b>	Thiruvananthapuram	1408.91	942.78	-33.1
	Kollam	1407.60	998.66	-29.1
<b>Central Zone</b>	Pathanamthitta	1549.33	974.85	-37.1
	Alappuzha	1519.98	764.19	-49.7
	Kottayam	1512.60	843.10	-44.3
	Idukki	1376.04	808.48	-41.2
	Ernakulam	1545.57	833.89	-46.0
	Thrissur	1451.69	883.48	-39.1

<b>North Zone</b>	Palakkad	1347.90	892.53	-33.8
	Malappuram	1260.75	934.76	-25.9
	Kozhikode	1388.89	1016.87	-26.8
	Wayanad	863.93	575.67	-33.4
	Kannur	1326.48	932.78	-29.7
	Kasaragod	1274.16	922.64	-27.6
	Total	1418.92	893.51	-37.0
Source: Farm Guide 2022, Government of Kerala.				

### Estimation of the extent of instability

Table 6 presents the Coppock's Instability Index for the rubber production in the Indian state of Kerala. The Coppock's Instability Index (CII) measures the stability of rubber production in each area. It is based on the comparison of the production and the productivity of the area. A higher CII indicates a more stable production and a lower CII indicates a less stable production. The stability of rubber production is important for the economic development of the region, as rubber production is a major source of income for the people of Kerala.

Table 6: Coppock's Instability Index for The Rubber in (%)

District	Area	Production	Productivity
Thiruvananthapuram	38.38	46.85	48.88
Kollam	37.68	45.79	46.90
Pathanamthitta	37.28	50.39	51.05
Alappuzha	38.29	57.49	59.83
Kottayam	37.12	55.13	55.62
Idukki	37.37	52.75	53.59
Ernakulam	37.41	55.97	56.91
Thrissur	37.83	50.83	52.27



Palakkad	38.47	47.10	49.24
Malappuram	39.90	41.92	45.46
Kozhikode	38.78	43.52	45.87
Wayanad	39.55	45.60	49.02
Kannur	39.27	44.21	47.19
Kasaragod	39.61	42.93	46.22
Total	38.06	49.32	51.02
Source: Farm Guide 2022, Government of Kerala.			

The table 6 illustrates the instability of area, production and productivity of rubber among 14 districts between two periods in Kerala. The instability is measured in percentage form. Regarding the area wise instability, the percentage of instability is almost similar in all districts. The instability in area under production of natural rubber in Kerala is 38.06 percent, with the highest in Malappuram (39.9 percent) and the lowest in Pathanamthitta (37.28 percent). In the case of instability in production of natural rubber, the instability is highest in Alappuzha, with 57.49 percent of instability between two periods. The degree of instability of production is lowest in Malappuram (41.92 percent). The instability in productivity under natural rubber in Kerala is 51.02 percentage. Among the 14 districts, the instability in productivity is highest in Alappuzha (59.83 Percent), while the lowest is in Malappuram (45.46 Percent). Overall, it is important to note that the instability in production and area under production of natural rubber is almost similar in all districts. Also, the instability in productivity under natural rubber in Kerala is 51.02 percent.

### **Reason for the low productivity of rubber in Kerala**

Kerala, a state in India, has been facing issues with rubber production due to a shift in cropping patterns from food crops to rubber. This shift is determined by the decisions of farmers and is attributed to various factors such as lagged yield, expected crop price, expected competing crop price, expected yield risk and price risk, average annual rainfall, usable area, etc.

The main cause for reduction in production of natural rubber is that, the rubber cultivators desist from tapping due to fall in prices of natural rubber. The diminishing return and high labour charge has forced many of the farmers, 70 per cent small and marginal farmers, to keep away from rubber tapping. The price is the main determinant factor for rubber production and when the prices fall, so does the production. On an analysis of area growth trends in Kerala, it was found that area and yield response of the rubber showed that the area under the rubber responded to price. Future price expectations are the dominant factor driving rubber acreage decisions in Kerala. The rubber market is highly volatile and the prices are dependent on the demand and supply of rubber. The market of rubber is an agro-industry and is directly related to the livelihood of millions of farmers. The rubber market is facing a shortage of million tonnes of rubber and this has led to a decrease in the production of rubber. The farmers in Kerala are facing too many problems due to price volatility and this has led to a decrease in the production of rubber, as the farmers do not find it profitable to tap rubber.

Various schemes have been proposed to protect the small rubber cultivators and ensure a minimum support price of Rs. 150 per kilogram. However, the unrestricted massive imports by larger tyre companies have led to a decrease in the domestic demand for rubber. This, along with the high input costs, cheap imports and signing of Free Trade Agreements between countries, has had a detrimental effect on the production of rubber. In order to increase the production of rubber and ensure the livelihood of the rubber cultivators, the government must take necessary steps to protect the small rubber cultivators and introduce various schemes to provide incentives and helps. This will help in ensuring a sustainable and increased production of rubber in the state, thereby providing better livelihoods to the rubber cultivators.

### **Institutional Support to Natural Rubber cultivation**

The Government of India has taken various initiatives to provide institutional support for natural rubber cultivation across the country. Table 7 provides an insight into the status of selected indicators of institutional support for four major crops in India - Rubber, Paddy, Tapioca and Tea. The indicators of institutional support include R&D support, planting subsidy, extension network and market support. The table indicates that R&D support is available for all the

four crops. This implies that the government is providing adequate research and development incentives for these crops. R&D support can be in the form of financial aid, technical assistance, infrastructure and resources, and other forms of support. It is essential for the productivity of these crops as it helps in the development of new and improved varieties.

The planting subsidy is available for Rubber and Tea, but not for Paddy and Tapioca. This implies that the government is not providing adequate incentives for the cultivation of these two crops. Planting subsidy is a form of economic incentive given to farmers to encourage them to grow a particular crop. It helps farmers to cover the costs of inputs such as seeds, fertilisers, and pesticides. The extension network is effective for Rubber and Tea, but weak for Paddy and Tapioca. The market support is effective for Rubber but ineffective for Paddy, Tapioca and Tea. This implies that the government is not providing adequate incentives for the marketing of these crops. Market support is essential for the promotion and sale of crops. It can be in the form of market infrastructure, promotion campaigns and other support measures. It shows that the farm gate price as per cent of terminal price is the highest for Rubber, but low for Paddy, Tapioca and Tea. It is essential to ensure that adequate institutional support is provided for these crops to ensure their productivity and profitability.

Table 7: Status of Selected indicators of institutional support

Crop/ Indicators	R&D support	Planting Subsidy	Extension network	Market support	Farm gate price as percent of terminal price
Rubber	Available	Available	Effective	Effective	Highest
Paddy	Available	Not available	Weak	Ineffective	Low
Tapioca	Available	Not available	Weak	Nil	Low
Tea	Available	Available	Effective	Nil	Low
Coconut	Available	Available	Weak	Ineffective	Low
Source: Author's observations from various sources					

## **Role of Rubber Board**

The Rubber Board provides direct technical advice to rubber growers, improves the marketing of rubber, collects statistics from owners of estates, dealers, and manufacturers, secures better working conditions and the provision and improvement of amenities and incentives to workers and carries out any other duties which may be vested with the Board as per rules made under the Act. Additionally, it provides advice to the Central Government on all matters relating to the development of the rubber industry, including import and export of natural rubber.

The role of Research and Development (R&D) has become increasingly important in Indian agriculture, particularly in relation to rubber production. R&D has the potential to provide long-term solutions to various problems faced by rubber farmers, such as seed problems, pest and disease problems, crop sustainability, climate change, irrigation problems and soil erosion. In order to provide adequate support to rubber farmers, the Rubber Board has implemented a planting subsidy scheme in a major boost to their sector. This scheme provides subsidies to rubber farmers for the purchase of planting material, such as seedlings, and helps to reduce farming costs. Furthermore, an agricultural extension service has been set up in order to provide technical aid and other essential inputs and services that support and increase agricultural production. In addition, a protected price policy regime has been introduced to supplement existing farm level support mechanisms for natural rubber (NR). These mechanisms have led to higher farm gate prices expressed as a percentage of the final consumer price. This policy has allowed rubber farmers to receive better returns for their produce and has helped to increase the profitability of rubber production. The government of India has also implemented various other measures to support the agricultural sector, such as improved access to credit and insurance schemes, increased public investment in agricultural research and extension services, and improved marketing and infrastructure.

Overall, the Rubber Board has been a major contributor in supporting the natural rubber cultivation in India and in improving the industry. It has been successful

in promoting research, training students in improved methods of planting, cultivation, manuring and spraying, improving the marketing of rubber, providing better working conditions and incentives to workers, and providing advice and support for the adoption of HYV seeds in agricultural farming. The Board will continue to be a major player in the development of the rubber industry in India in the years to come.

### **Main findings and Concluding remarks**

Natural rubber production in Kerala has been decreasing for the last decade, but it has seen a significant increase in the north-eastern parts of the country, particularly in Tripura, Assam and Nagaland during 2019-20. The production of Natural rubber is contributed by the factors of area and yield. The area of natural rubber in Kerala has been steadily increasing over the last few decades, while the production and productivity of natural rubber has been decreasing. The production of natural rubber in Kerala has declined over the last decade, with a decrease of 492500 tonnes in 2019-20 from the 2009-10 figure of 745510 tonnes. The main cause for this reduction has been the low returns from cultivation. All districts in Kerala have seen a decrease in rubber productivity, with Alappuzha, Kottayam, Idukki, and Ernakulam showing a decrease of more than 40%. Kottayam, Pathanamthitta and Ernakulum are the major rubber producing districts in the state, while Alappuzha, Trissur and Wayanad are the least productive districts.

As rubber is a perennial crop with a long lifespan, its growth and yield are influenced by many parameters. Soil fertility and meteorological factors are the most critical factors that are analysed and found to impact natural rubber production. Therefore, there is a need to encourage farmers to take periodic stock, planting, and replanting initiatives, as well as protecting their interests through the imposition of duties. Rubber and rubber-based sector has been a key contributor to the state's growth and the high demand for rubber has opened immense opportunities for the state in the rubber sector. Kerala produces 90 percent of the total supply of rubber wood in India.

In conclusion, rubber is a key plantation crop in the world, providing benefits to both human life and economic strategies. The government is working actively to

improve the production and productivity of natural rubber in the state by introducing various schemes and initiatives such as the Rubber Board. In addition, the government has also set up a Rubber Research Institute to promote research and development in rubber production. Natural rubber production in certain parts of India has seen an increase in the past year, while Kerala state has seen a decrease in production. It is important to encourage farmers to take periodic stock, planting, and replanting initiatives, while also providing protection to their interests through imposition of duty. Interventions at the institutional, governmental, and inter-governmental levels are needed to address the issues of rubber farmers in Kerala, which will benefit the welfare of small and marginal farmers and save the rubber-based industry.

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# COSCINIUM FENESTRATUM STEM EXTRACTS INHIBITS LIPOGENESIS IN DIFFERENTIATING 3T3-L1 CELL LINES IN VITRO

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## Abstract

*Coscinium fenestratum*, also known as tree turmeric, belongs to the Menispermaceae family. It grows widely in Western ghats (India) and Sri Lanka. The plant is well known for its anti-diabetic and anti-cancer effects. In the present investigation, we examined the effect of methanolic extract of *Coscinium fenestratum* stems on adipocyte differentiation in vitro. 3T3-L1 cells are preadipocytes which can be induced to differentiate into adipocytes under controlled conditions. 3T3-L1 cells were cultured to confluence and then exposed to 5, 15, 25 and 50 µg/ml of the methanolic extracts along with the differentiation media. Cells were treated with the extracts with every media change. After 8 days, the lipid accumulation within the cells were quantified by Oil Red O staining. The stem extracts inhibited lipid (triglyceride and cholesterol oleate) accumulation in the treated cells and the inhibition was directly proportional to the concentration of the extract. Partial phytochemical screening of the extracts revealed the presence of Phenolic acids, Flavonoid, Berberine, Phenol, Xanthone, Flavonols, Saponins, Diterpenoids, Triterpenoids and Carotenoids. The inhibition of lipogenesis might be due to the presence of berberine and carotenoids detected in the stem extracts.

**Keywords:** Adipocyte differentiation, Anti-lipogenesis, anti-adipogenic, *Coscinium fenestratum*, Oil red staining and 3T3-L1 cells.

## Introduction

Obesity and its co morbidities are increasing worldwide at an alarming rate (Consultation, WHO,1998). Obesity is associated with the development of metabolic syndrome, cardiovascular diseases, stroke, osteoarthritis etc (Singla et al., 2010, Derdemezis et al., 2011).

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It is mainly caused by an imbalance between the intake and expenditure of energy (Ordova and Shen, 2008). Complex interactions of genetic, behavioural, environmental factors, social status and lifestyles could play a role (Kwang et al., 2009). Life style modifications like restricted calorie intake, physical exercise etc are some of the strategies recommended to combat this chronic disease. Anti-obesity drugs currently available can cause side effects (Mohamed et al., 2014). Therefore, the focus is now on natural products to combat obesity. Several natural products have been identified with anti-obesity properties (Paula et al., 2010). These compounds have been reported to either decrease lipid absorption, prevent lipogenesis or increase lipolysis, as well as interfere with the differentiation and proliferation of preadipocytes (Rayalam et al., 2008).

Lipid homeostasis is maintained primarily by the adipocytes, which store triglycerides and release free fatty acids as per energy requirements. 3T3-L1 pre-adipocytes cell lines express adipocyte specific genes, like PPARc and C/EBPa (1999, Wu et al., 1999) and are often used to screen natural products for their ability to suppress adipocyte differentiation, inhibit lipid accumulation etc. (Kim et al., 2006, Madsen et al., 2005).

Several natural products like catechins found in green tea (Thielecke and Boschmann, 2009, Gupta et al., 2008), anthocyanins present in Hibiscus sabdariffa (Janson et al., 2021), hydroxy citric acid in G. cambogia (Kim et al., 2004), ellagic and tannic acids in pomegranate extract (Lei et al., 2007), gingerol and shogaol found in ginger (Mahmoud and Elnour, 2013) have been reported to have anti-obesity effects.

In the present investigation we have studied the effect of *Coscinium fenestratum* on adipocyte differentiation. This plant grows widely in the Western Ghats (India) and Sri Lanka belongs to family Menispermaceae and commonly known as tree turmeric because of its yellow wood and sap (Tushar et al., 2008). The plant has been mainly used for treating diabetes mellitus in the traditional Ayurvedic and Siddha systems of medicine (Kolammal, 1978, Nambiar et al., 2000). The stem extracts have also been used for treating inflammations, wounds, ulcers, jaundice, burns, skin diseases, abdominal disorders, diabetes, fever and general debility (Agusta, 2003). However, till date no report is there on the anti-lipogenic activity of *Coscinium fenestratum*. This paper demonstrates the anti-lipogenic effect of methanolic extract of *Coscinium fenestratum* stems on 3T3-L1 cell lines in vitro.

## **Materials and Methods**

### **Preparation of Plant Extract**

Coscinium fenestratum stems were dried and powdered mechanically and subjected to soxhlet extraction using methanol for about 48 hours. The extract was filtered, concentrated in vacuum under reduced pressure using rotary flash evaporator and dried in the desiccator and the extract was kept in refrigerator until use (Tungpradit et al., 2011).

### **Cell Culture**

#### **Preadipocyte Maintenance and Passage**

3T3-L1 preadipocytes were obtained from NCCS, Pune, cultured in Dulbecco's modified Eagles medium (DMEM) containing 10% fetal bovine serum (FBS), 4.5g/L glucose, 3.7g/L of sodium bicarbonate and 100 mg/L of penicillin, streptomycin and gentamycin in an atmosphere of 5% carbon dioxide at 37°C. Cells were sub cultured every three days.

#### **Adipocyte Differentiation Protocol**

Preadipocytes were grown to 75 % confluency in 10 % FBS -DMEM. 2 days post confluency, replaced the media with MDI media containing 10% FBS-DMEM, IBMX, dexamethasone, insulin (Day 0). After 2 days, replaced MDI media with insulin media containing 10 % FBS-DMEM, Insulin (Day 2). After 2 days replaced Insulin Media with 10% FBS-DMEM (Day 4). Feed with 10% FBS-DMEM every two days. Complete differentiation achieved by Day 8.

#### **Treatment of Cells with Extracts**

The stem extracts were dissolved in ethanol, to a concentration of 5mg/ml. The viable pre adipose cells were counted by trypan blue dye exclusion method and adjusted to 10<sup>4</sup> cells/ml. 2 ml of 10<sup>4</sup> cells/ml preadipocytes were treated with extracts of concentrations 5µg/ml, 15µg/ml, 25µg/ml and 50µg/ml respectively along with MDI (methylisobutylxanthine, dexamethasone, insulin) media on Day 0. Extracts are added during subsequent media change also. The cell cultures were regularly observed under phase contrast microscope and image captured.

## **Quantification of Adipogenesis**

Media in the culture flask were removed and cells fixed with formaldehyde for 30 min. Formaldehyde was removed and cells treated with Oil red O solution for an hour at room temperature. The cells were then washed twice with distilled water and air dried. The cells were observed under light microscope and the image captured.

Oil red O taken up by the cells was then extracted out using 60% isopropanol. Absorbance of the extract was measured at 510 nm and quantified using pure Oil red O standard curve. The quantity of Oil red O taken up by the cells corresponds to the triglyceride and cholesterol oleate present.

## **Statistical Analysis**

All cell culture experiments were conducted in triplicates. The results were expressed as Mean  $\pm$  S.D. Statistical valuations were done by ANOVA test using graph pad INSTAT ver 2. Software.

## **Partial Phytochemical Analysis of the Methanolic Extract**

UV- Visible absorption: The extracts were solubilized in ethanol and scanned using UV-Visible spectrometer (Thermo Spectronic, USA) at the range of 200-600nm. The absorption maxima of the peaks obtained were used for detection of phytochemicals. (Harborne, 2005).

Detection of alkaloids: TLC was performed with silica gel plates and using Cyclohexane: Chloroform: Diethylamine [50:40:10] as solvent system and Dragendorff reagent was used as the developing agent.

Detection of flavonoids: TLC was performed with the solvent system Chloroform: Ethyl acetate: Methanol [2:2:1] and 2% Aluminium Chloride as developing agent.

Detection of saponin: TLC was performed with the solvent system Chloroform: Methanol: Water [65:35:10] and Antimony III Chloride as developing agent.

Detection of diterpenoids: TLC was performed with the solvent system Hexane: Ethanol [17:3]. and Antimony III Chloride as developing agent.

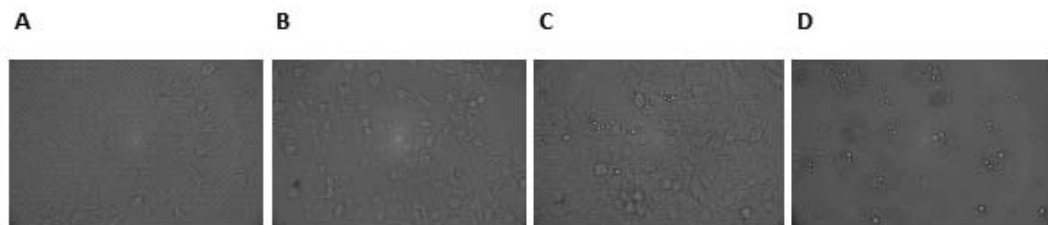
Detection of triterpenoids: TLC was performed with the solvent system Hexane: Ethanol [1:1]. and Antimony III Chloride as developing agent.

Detection of carotenoids: The extracts was tested for the presence of carotenoids by paper chromatography. Butanol: Acetic acid: Water [4:1:5] was the solvent system used.

## Results

Complete Adipocyte differentiation was achieved on Day 8. Changes in the morphology of the cells was monitored throughout the differentiation process using phase contrast inverted microscope. Two days post subculture (i.e., on attaining 75 % confluency), the cells appeared like fibroblasts (Figure 1A). On addition of MDI media (Day 0), the cells became spherical (Figure 1B). With the addition of Insulin media (Day 2), lipid droplets were seen within the cells (Figure 1C). With the 10 % FBS-DMEM media change on Day 8(Figure 1D), the cells appeared rounded with large lipid droplets within the cells. On staining the differentiated cells with Oil Red O stain, the lipid droplets appeared red in color and the cells appeared colorless (Figure 2).

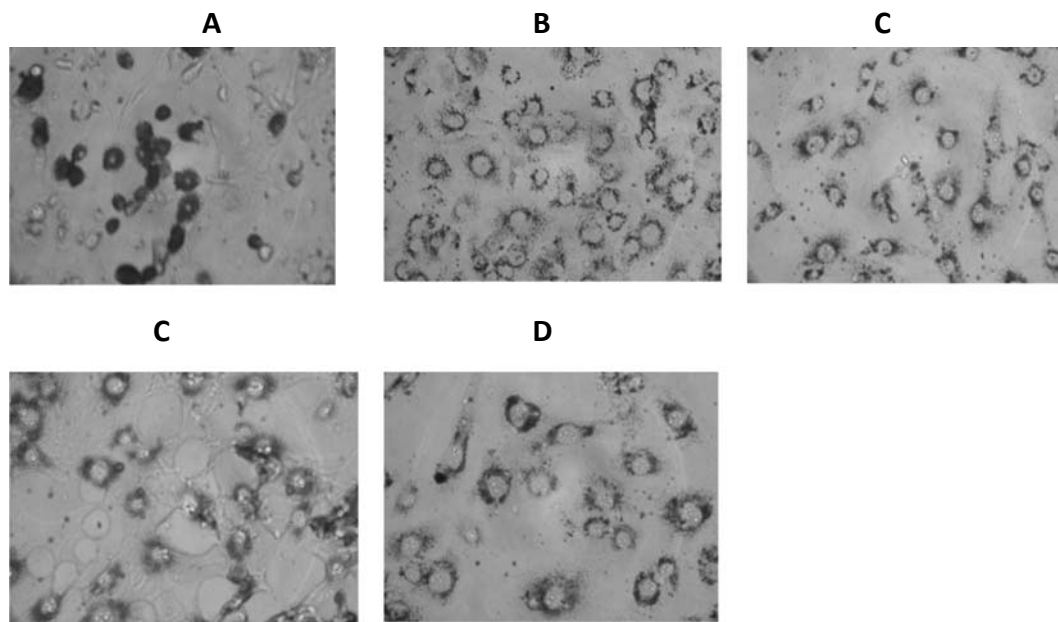
**Figure 1 Representative images of the morphological changes in 3T3-L1 cells during the adipocyte differentiation under phase contrast inverted microscope 400x magnification**



**A** Cells at 75 % confluency, **B** Cells at Day 0 addition of MDI, **C** Cells at Day 2 with lipid droplets within the cells, **D** Cells at Day 8 with lipid droplets within the cell.

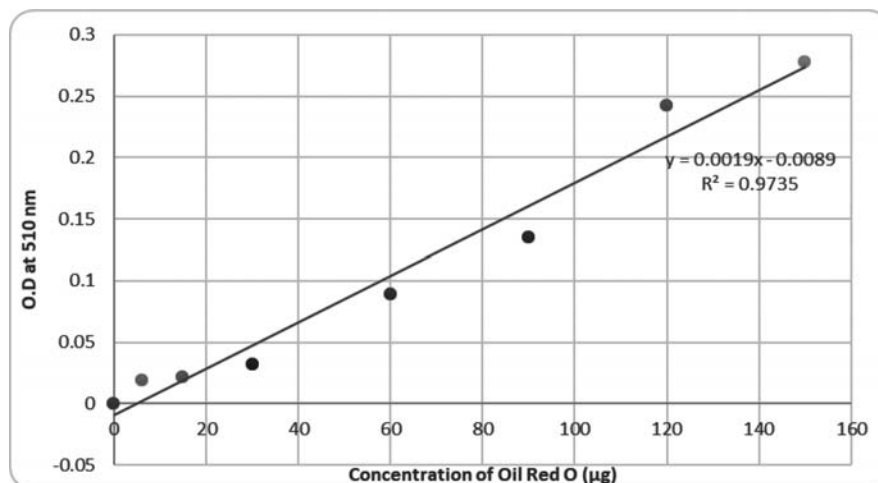
The 3T3 –L1 cells appeared to be differentiated without losing cell integrity at 5 µg/ml concentrations (Figure 2B). The cells appeared to retain some of the characteristics of undifferentiated cells at 15, 25 and 50 µg/ml (Figure 2C-E) respectively. A dose dependent decrease in lipid accumulation was observed as compared to Control (Figure 2A).

**Figure 2** Representative images of differentiated adipocytes at Day 8 stained with Oil red O to localize the lipid droplets under light microscope 400x magnification

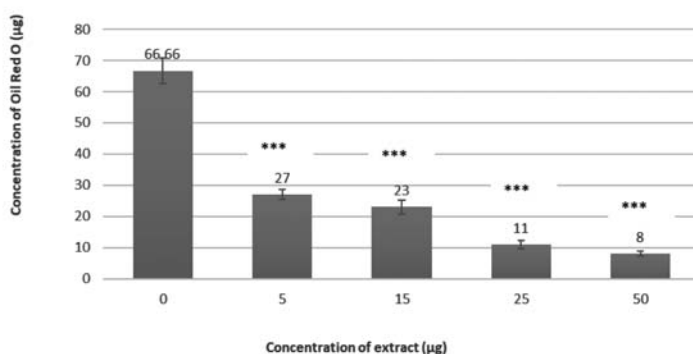


A- control cells, B-E cells treated with methanolic extract at 5 µg/ml, 15 µg/ml, 25 µg/ml, 50 µg/ml respectively.

**Figure 3** Standard graph for quantification of Oil red O



**Figure 4 Effect of Methanolic extracts of *Coscinium fenestratum* stems on Lipid accumulation**



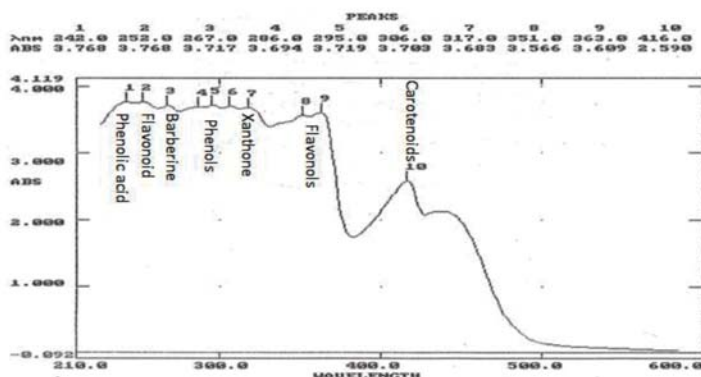
Values are expressed as Mean  $\pm$  S.D. for 3 independent determinations

\*\*\* $p < 0.001$  as compared to 0  $\mu\text{g}$  extract

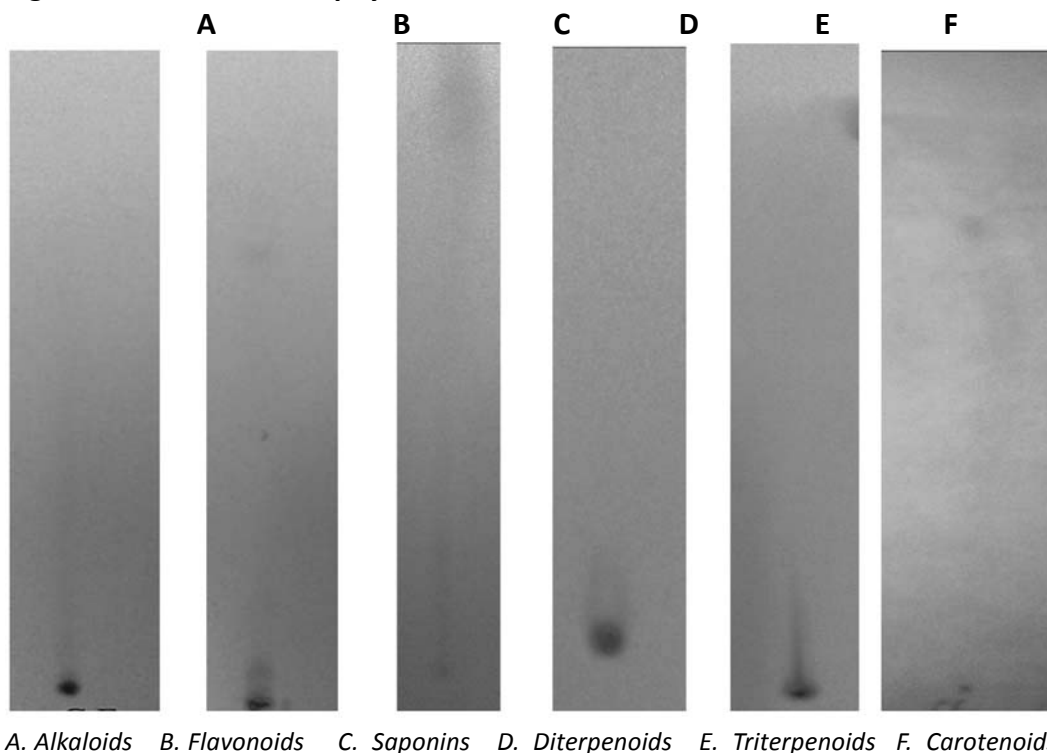
Oil red O stains triglycerides and cholesteryl oleate within the cells (Ramirez et al., 1992). Oil red O extracted from the stained cells was quantified using a standard curve (Figure 3). Oil red O extracted from methanolic extracts treated cells showed that there is a significant ( $p < 0.001$ ) dose dependent response to inhibition of adipogenicity in 3T3-L1 cells (Figure 4).

UV-Visible absorption spectra revealed the presence of Phenolic acids, Flavonoid, Berberine, Phenol, Xanthone, Flavonols and Carotenoids (Figure 4). Phytochemical analysis of the extracts using TLC demonstrated the presence of Alkaloids, Flavonoids, Saponins, Diterpenoids, Triterpenoids and Carotenoids (Figure 5).

**Figure 5: UV -VIS Spectra of methanolic extracts of *Coscinium fenestratum* stems**



**Figure 6 Detection of phytochemicals**



## Discussion

Considering the increasing prevalence of obesity and its associated co-morbidities, development of anti-obesity drugs that are natural and safe is the need of the hour. Screening for potential anti-obesity drugs have focused on adipocyte proliferation and differentiation (Cannon and Nedergaard, 2004). 3T3-L1 pre-adipocytes cell lines are efficient and easy model system to study the same. We have used Oil Red O staining to quantify the extent of lipid accumulation since it specifically stains triglycerides and cholesteryl oleate. The methanolic extracts of *Coscinium fenestratum* stems significantly inhibited the accumulation of lipids in the adipocytes and the extent of inhibition was proportional to the concentration of the extract used. The amount of stain extracted is proportional to adipocyte differentiation (Ramírez et al., 1992). We detected the presence of alkaloids, saponins, flavonoids, diterpenoids, triterpenoids and carotenoids in the stem



extracts. The main ingredient present in the stem extract was found to be an alkaloid, Berberine (Goveas and Abraham, 2014). Berberine has been reported to have both anti-adipogenic and anti-inflammatory effects on 3T3-L1 adipocytes, and the anti-adipogenic effect seems to be due to the down-regulation of adipogenic enzymes and transcription factors (Choi et al., 2006). Further, berberine was found to inhibit 3T3-L1 adipocyte differentiation through the PPAR gamma pathway (Huang et al., 2006). Hwang *et al.*, (2009) further demonstrated that the anti-obesity effect of berberine in high fat fed mice. Carotenoids, are also known to suppress adipocyte differentiation (Kawada et al., 2000).

## Conclusion

Methanolic extracts of *Coscinium fenestratum* stems show a dose dependent reduction of triglycerides and cholesteryl oleate in differentiating 3T3-L1 cell lines. The phytochemicals present particularly the alkaloid berberine and carotenoids detected in the extracts could play a role. Ours is the first report on the anti-adipogenic property of *Coscinium fenestratum*, and can further be tested for the development of anti-obesity drugs.

## Acknowledgements

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# REVISITING THE PREBISCH-SINGER THESIS: A STUDY OF TERMS OF TRADE AND GDP IN THE PRE AND POST LIBERALISATION INDIA

Alen Joshy

## Abstract

*The Prebisch-Singer thesis posits that primary product-exporting countries experience a long-term decline in their terms of trade due to inelastic demand for primary products and the ability of developed countries to produce manufactured goods more efficiently. However, recent data shows an increase in the terms of trade for many primary product-exporting countries, indicating a deviation from the original thesis. This study investigates the relationship between terms of trade and GDP in primary product-exporting countries using Spearman's rank correlation and tests the null hypothesis that the two variables are independent. Analysis finds a moderate positive correlation between the two variables, and a rejection of the null hypothesis, indicating a statistically significant relationship between terms of trade and GDP. While the results suggest that an increase in terms of trade leads to an increase in GDP, it is important to acknowledge that correlation does not imply causation, and other factors may be contributing to the observed relationship. The findings contribute to ongoing discussions on the relevance of the Prebisch-Singer thesis in today's global economy and highlight the need for further research to understand the drivers of changes in terms of trade for primary product-exporting countries.*

**Keywords:** Prebisch-Singer thesis, terms of trade, developing countries, primary products

## Introduction

In the 1960s and 70s Raul Prebisch and Hans Singer analysed the terms of trade implications for countries which rely heavily on primary product exports. The inevitable result of industrialisation is the rise of manufacture exports of developed nations. This would eventually rule out the possibilities of any trade improvements for LDCs. The Prebisch Singer thesis studied the secular deterioration in terms of trade that happens to these LDCs in the long run. The productivity improvements in underdeveloped countries in the absence of an increase in domestic activity coupled with weak industrialization was observed to be a major cause of this deterioration in exports.(R, 2012)

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It is well known that Latin American and South Asian countries have undergone a period of structural change in the 1980s and 90s. These nations were able to surpass the lacuna imposed on them due to colonisation, resource scarcity and so on. They have managed to catch up with the developed nations in the initial years of their development post colonisation. These LDCs were mostly focussed in agriculture and services in their production, trade and in terms of jobs. However, at a certain point they have switched gears to focus on manufacturing sector as a primary focus of their activities. It is often attributed to the emphasis laid by Prebisch and Singer in their work on import substitution that these nations were driven to carry out this structural transformation.

This theory was based on the knowledge that primary products have a low-income elasticity of demand, meaning that as income rise, the demand for primary products does not increase at the same rate as the demand for manufactured goods. This leads to a scenario where primary producing countries are unable to earn as much from their exports as they would like, while developed countries benefit from the higher prices of manufactured goods. (Toye & Toye, 2003)

In the recent years there is a growing interest in revisiting Prebisch-Singer thesis in the context of post liberalization India. Although trade and foreign investment significantly increased as an outcome of the liberalisation of the Indian economy in the 1990s, the terms of trade and GDP of the nation were also significantly impact is crucial to examine terms of trade and GDP in pre- and post-liberalization India because doing so can shed light on how economic policies affect the nation's economic growth.

Prebisch and Singer stressed on the need to create indigenous technological capacity or wealth. This is crucial because it can highlight the significance of domestic technology in fostering economic development, as developing nations like India frequently encounter difficulties importing and implementing foreign technology. Developing countries face challenges in acquiring and adapting foreign technology due to various factors like lack of access to knowledge, capital and skilled labour. This limits their abilities and makes them dependent on the developed countries for technological inputs. By developing indigenous technology developing countries can reduce this dependence on foreign technology

and create new opportunities for innovation and entrepreneurship (Geronimi & Taranco, 2018). For developing countries indigenous technology can also be used to add value to their primary products and develop manufacturing units. This can, in turn, help to reduce their dependence on exports of primary products and improve their terms of trade. As the nations at the periphery attempts to wedge this gap with the centre, they will push for more industrial imports. It will automatically create disequilibrium in the balance of payments. It will outgrow the primary exports as well. These authors promoted import substitution on par with export promotion to defeat the terms of trade deterioration in developing economies. This excessive reliance on import substitution can in fact reduce the import content of exports. Even in the context of global value chains the export promotion facilitates the forward participation in exports. The backward participation implies an excessive reliance on imported inputs in production. (R, 2012)

## **Literature Review**

(Singer & al, 2002) claimed that the increase in openness could ultimately result in the coming of new and non-traditional exports. This resultant diversification would eventually lead to reduced volatility and improvement in terms of trade. The East Asian miracle is largely a result of promoting new and non-traditional exports. Here, it's important to diversify away from raw, basic commodities, which are more volatile, and towards processed and manufactured goods. (Cuddington and Urzua, 1989) discovered that the secular decline theory was not a strong alternative to a once-and-for-all shift in commodity prices in 1920-1921. Powell discovered that, after accounting for three negative increases in non-oil commodity prices and manufactured goods prices in 1921, 1938, and 1975, they are co integrated. This measure of the terms of trade is stationary with three breaks, each of which denotes a negative shift. (Powell, A,1991). (Hazell et.al, 1995) argued that increases in agricultural output are found to worsen the terms of trade for agriculture. (T. Rajarajan,2006) claimed that the terms of trade of Indian dairy products have declined in the post-liberalization period as compared to pre-liberalization years. (Bhalla and Singh, 2009) found that economic reforms were expected to improve the terms of trade in favour of agriculture and promote its growth. This study was a state level analysis of the performance of agriculture in India during the post reform period and the immediate pre reform period.

Kumar and Bishnoi in 2020 argued that even though quantity terms of trade for agricultural sector of India were deteriorated by 80.9% from 429.41 in 1975 to 82.05 in 1994 quantity and value terms of trade for agriculture improved in the post WTO period compared to the pre-WTO period. (Mukherjee, 1985) studied the terms of trade for invisibles during the period 1950-52 to 1966-67. The ratio at which invisibles exported are being exchanged for invisibles imported is required to meet terms of trade for invisibles may be described as the ratio at which invisibles exported are being exchanged for invisibles imported. India's commodity and income terms of trade have improved over time, with faster growth in the latter. Both commodity and income terms of trade for India's invisibles have been rising secularly, without any evidence of deterioration or stagnation. There has been a favorable impact on terms of trade from changes in exports, with impressive progress in both commodity and income terms of trade. The agriculture terms of trade are difficult to be estimated based on the gross barter terms of trade. The quality improvement factor could prove to be influential especially when we compare agriculture to manufacture goods prices. The study used Grill and Yang dataset in order to pinpoint the limitations of analyzing the agriculture terms of trade by seeing the implications of adjusting the manufacturing price deflator for quality enhancements and of broadening the price comparison to the service sector. Also, the question of what agriculture commodity prices should be computed if we are to consider the welfare for agriculturists. Colman has enquired whether the decline in commodity terms of trade negatively impact the agriculture section as the popular notion goes. The study has attempted to show the weakness of commodity terms of trade tests. It is worth noting that much of the literature has rejected the Prebisch Singer thesis. (Colman, 2010)

(Stanley,1999) studied terms of trade instability and claimed that Guatemala diversified its exports into non-traditional agricultural and manufactured products, while Honduras relied on primary products. Surprisingly, Honduras maintained stable earnings despite its dependence on primary products, while Guatemala's exports failed to counter instability despite diversification. This indicates that there should be a strategic approach to diversification, as some products may lead to severe volatility later. Other potential impediments to successful stabilization include limited market exports and supply chain disruptions. These



papers have mixed findings on how changes in agriculture terms of trade affect GDP growth. (Hazell, 1995) found that the terms of trade were not an important factor in explaining past growth in India, suggesting that changes in the terms of trade are not an important factor in GDP growth. However, (Kohli, 2004) found that real GDP tends to underestimate the increase in real domestic income and welfare when the terms of trade improve, suggesting that changes in the terms of trade can affect GDP growth. Additionally, (Hwa, 1988) found that in the context of an aggregate production function agricultural growth is found to contribute significantly to productivity increases and thus to overall economic growth, suggesting that changes in agriculture can affect GDP growth. (Schmitt, 1990) found that agriculture's contribution to GDP steadily declines in the longer run, so that its share in national product as well as in total labour input diminishes. This is not directly about GDP growth, but we'll include it in our summary since agriculture is related to GDP growth. This study attempts to identify the status of terms of trade (between agriculture and non-agriculture sectors) in India in contrast to the traditional argument of secular decline in terms of trade advocated by Prebisch Singer thesis. The study also seeks to establish an additional correlation between the GDP growth and the terms of trade (between agriculture and non-agriculture sectors) during this period (1980-2009). The study attempts to answer the following questions: Has Prebisch singer argument remained relevant in the context of Indian agriculture? How have GDP growth and terms of trade (between agriculture and non-agriculture sectors) impacted each other since 1980s? Is there a significant relationship?

## **Objectives**

1. To determine the significance of trade liberalization on the terms of trade between agriculture and non-agriculture sectors during the period 1980-2009.
2. To assess the significance of the relationship between the terms of trade index and GDP growth during the period of 1980-2009.

## **Hypothesis**

There is no significant relationship between terms of trade and gross domestic product.

## **Theoretical Framework**

Prebisch Singer thesis explains the terms of trade created by unfavourable trade between developing and developed nations. As an exporter of manufacture products, developed nations will possess significant leverage in achieving better terms of trade compared to developing countries. Developing countries will export primary products. The prices of these products are significantly lower compared to manufactured products. Thus, they end up facing an unfavourable term of trade. As a way to get out of this, Prebisch and Singer has suggested export diversification. Export diversification especially at the product level could be an antidote to the problem of poor terms of trade. On this backdrop, countries have chosen to diversify their exports. (Salvatore, 2013)

## **Methodology**

The study used secondary sources of data for attaining the objective of the study. The data was collected from sources such as Directorate of Economics and Statistics, FAOSTAT (data on GDP). Spearman Rank Correlation is a statistical method used to measure the strength and direction of association between two variables. It is a non-parametric measure that assesses how well the relationship between two variables can be described using a monotonic function, rather than a linear one.

The Spearman Rank Correlation coefficient ranges from -1 to +1, where -1 indicates a perfectly negative correlation, +1 indicates a perfectly positive correlation, and 0 indicates no correlation between the variables.

A Spearman Rank Correlation coefficient of, for example, +0.7 between two variables implies a strong positive correlation between the variables, whereas a coefficient of -0.4 implies a moderate negative correlation.

## **Descriptive Statistics**

A descriptive statistic is performed to summarize the key features of the data, such as the mean, median, standard deviation, and range.

Table 1

Variable	Obs	Mean	Std. dev.	Min	Max
Index of terms of trade	29	100.3621	4.720882	88.7	106.6

Based on the given data on the index of terms of trade between agricultural and non-agricultural sectors, the mean value is 100.36 with a standard deviation of 4.72. The minimum and maximum values of the index are 88.7 and 106.6, respectively. This suggests that the agricultural sector's terms of trade have fluctuated over the period, with a mean value close to 100 indicating that the agricultural sector has traded relatively evenly with the non-agricultural sector. However, the deviation from the mean suggests that there have been periods of relatively favourable and unfavourable terms of trade for the agricultural sector.

The descriptive statistics presented in the table show that these are 29 observations for the index of terms of trade. The mean of the index is 100.3621, indicating that on average, the terms of trade for the primary products have remained stable over time. The standard deviation of 4.720882 suggests that the values of the index are relatively tightly clustered around the mean, with little variation between observations.

These descriptive statistics are relevant because they provide a summary of the central tendency, dispersion, and range of the index of terms of trade. They help to identify the overall pattern and level of variability in the data. Policymakers can use the mean and standard deviation to assess the stability and volatility of the terms of trade, and adjust their policies accordingly to make certain that country's economy is not adversely affected by fluctuations in the terms of trade. It can be used to compare the index of terms of trade across different countries and time periods to identify patterns and trends in global trade.

### **Significance of the Study**

Agriculture sector had better opportunities to flourish due to the global value chains. The multilateral trade provides more markets and more competition to operate with. It must be outlined that agricultural exports had prospered even when it encountered the obstacles of protectionism and new protectionism from the developed world during this time period. To add to these impediments there

were other things such as the global financial crisis. Yet the Government has given some policy boost and encouragement for agribusinesses and agriculture sector in general. There were new avenues to diversify the exports and to generate greater value addition in the exports. This has enabled an integration of the products into the global value chains. This has indeed led to a resurrection of the agriculture exports as well. The GDP of agriculture has experienced a growth of 69.8% from 1992-2008 and CAGR of 3.0 % from 1991-92 to 2008-09. The share of agriculture exports in the GDP indicates three aspects firstly, there is degree of openness or outward orientation of the agriculture sector with regard to export activity. Secondly the impact of agriculture trade strategies taken up in the country. Thirdly the supply capacity of agriculture sector as regards exports. The trend growth rate of agricultural output is slightly ahead of population growth. Therefore, it is mandatory that agriculture sector needs a greater pace. The increase in agriculture sector is necessary not only for food grain production but also for generating enough surpluses for export.(Thomas & Sheikh, 2010)

It is observed that the agriculture exports dipped in its share in total exports during the early stage of liberalisation and during the financial crisis. "The share of agricultural exports in the total exports was 17.9 per cent in 1991-92, which has increased to nearly 3 per cent by the year 1996-97, there after the share was continuously declining and it reduced to 9.9 per cent in 2006-07. Between the year 2006-07 and 2007-08 there was an increase of 2.3 per cent. With a fall in 2008-09 to 10.2 per cent it has seen a growth of 0.4 per cent in 2009-10." (Thomas & Sheikh, 2010) The share of Agriculture and Allied products reduced from 14.19% accounting for US\$ 6256 mn in 2000-2001 to 9.7% accounting for US\$ 24448 million in 2010-11 (Fathipour & Gaikwad, 2018). The agriculture exports have risen much slowly with its ups and downs in the total share of exports. Even though there is a decline in the total share of agriculture exports, there is a steady decline in the percentage share of primary products in total export from 17.9% to 10% during the period from 1991-2009. This shows the slow rise in agriculture exports in comparison to national exports(Thomas & Sheikh, 2010).

## Data and Interpretation

**Table 1.1: Index of Terms of Trade between Agricultural and Non - Agricultural Sectors**

Year	Index of Prices Received (IPR)	Index of Price Paid (IIP) for			Index of Combined Index	Terms of Trade (ITT)
		Final Consumption	Intermediate Consumption	Capital Formation		
Weights		73.54	21.63	4.83	100.0	
1	2	3	4	5	6	7
1981-82	54.9	54.4	88.5	56.9	61.9	88.7
1982-83	60.3	58.8	91.1	62.6	66.0	91.4
1983-84	64.2	64.2	91.0	67.4	70.1	91.6
1984-85	68.0	66.6	92.3	72.5	72.4	93.9
1985-86	70.4	69.5	94.3	76.4	75.2	93.6
1986-87	76.7	74.8	98.7	78.8	80.2	95.7
1987-88	86.0	84.6	102.3	82.5	88.3	97.4
1988-89	90.3	90.4	96.9	90.9	91.8	98.3
1989-90	97.5	97.6	99.2	100.6	98.1	99.4
1990-91	112.3	112.1	104.0	108.5	110.2	101.9
1991-92	130.8	124.9	119.4	127.2	123.8	105.6
1992-93	138.7	131.5	139.5	137.5	133.5	103.9
1993-94	151.4	143.9	152.9	147.3	146.1	103.6
1994-95	171.1	159.0	166.1	158.4	160.5	106.6
1995-96	182.9	173.4	174.2	176.1	173.7	105.3
1996-97	190.6	185.6	181.5	188.8	184.8	103.1
1997-98	205.9	195.7	192.0	196.7	194.9	105.6
1998-99	220.8	213.8	197.1	206.8	209.9	105.2
1999-00	219.8	217.1	203.9	212.6	214.0	102.7
2000-01	225.0	220.5	230.4	227.0	223.0	100.9
2001-02	235.3	226.4	235.2	240.4	229.0	102.8
2002-03	247.9	234.9	252.7	245.2	239.3	103.6
2003-04	251.2	245.2	259.1	255.7	248.7	101.0
2004-05	258.2	252.3	264.5	305.6	257.5	100.3
2005-06	275.8	266.0	277.1	310.5	270.6	101.9
2006-07	291.2	283.4	284.6	327.8	285.8	101.9
2007-08*	324.3	323.2	301.5	356.1	320.1	101.3
2008-09*	350.9	350.8	332.8	380.1	348.3	100.7
2009-10*	411.6	415.1	355.0	394.0	401.1	102.6

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

The above table shows the index of terms of trade for each year. The terms of trade is calculated by dividing the index of prices received by a country for its exports by the combined index of prices for both its exports and imports, and then multiplying by 100.

Index of terms of trade is obtained by dividing IPR by the combined index, and multiplied by 100. The index of terms of trade provides an indication of the relative prices of a country's exports to its imports. When the index is above 100, it indicates that a country is receiving higher prices for its exports compared to the prices it is paying for its imports, which is generally considered favourable.

Looking at the table, we can see that the index of terms of trade fluctuated over the years. It was relatively low in the early 1980s, but then increased steadily throughout the 1980s and 1990s before declining slightly in the early 2000s. In the late 2000s, the index remained relatively stable, although it did experience some minor fluctuations. Overall, the index of terms of trade can be used as an indicator of a country's economic well-being, as higher terms of trade can lead to increased income and growth, while lower terms of trade can have the opposite effect.

## **Findings**

The Prebisch-Singer thesis argued that developing countries that rely heavily on the export of primary products would experience a secular decline in their terms of trade, meaning that over time, the prices of their exports would fall relative to the prices of their imports. This was thought to be due to the inelastic demand for primary products and the ability of developed countries to produce manufactured goods more efficiently, leading to a widening gap between the prices of primary products and manufactured goods.

However, the data presented in the table shows that the terms of trade for many primary product-exporting countries have actually increased over time, contradicting the premise of the Prebisch-Singer thesis. This could be due to a number of factors, including changes in global demand for primary products, improvements in productivity and efficiency in primary product production, and the emergence of new export markets.

It is worth noting that the Prebisch-Singer thesis was formulated in the mid-20th century, and the global economic landscape has since undergone significant changes. While the thesis may have been applicable to the world economy of that time, it may no longer be accurate in explaining the terms of trade for developing countries today.(Toye & Toye, 2003)

In summary, the data presented in the table suggests that the original premise of the Prebisch-Singer thesis, which posits a secular decline in terms of trade for primary product-exporting countries, may no longer hold true in the current global economic context.

The second part of the study was conducting a correlation analysis between the terms of trade data and GDP during the period from 1980 to 2009.

Number of observations = 29

Spearman's rho = 0.4587

Test of H0: index of terms of trade and GDP are independent

Prob > |t| = 0.0123

The correlation coefficient between the index of terms of trade and GDP was 0.4587, which means there is a moderate positive relationship between the two variables.

A test was performed to see if the two variables are independent or not. The results showed that the probability of the two variables being independent is very low, which means there is a significant relationship between them. The test of the null hypothesis (H0) that the two variables are independent resulted in a probability (p-value) of 0.0123, which is less than the conventional significance level of 0.05. Therefore, we can reject the null hypothesis and conclude that there is a statistically significant relationship between the index of terms of trade and GDP.

## Conclusion

In the current paradigm, countries are seeking to overcome the threat of terms of trade decline or instability using methods such as export diversification. However, Prebisch Singer thesis still hold a relevance when considering the evolution of global value chains and the new requirements of competitiveness. There is sufficient evidence from the available literature that through diversification of exports commodity shock risks, price instabilities and terms of trade can be reduced and rate of growth can be improved (Sarin et al., 2020). The data presented (table 1.1) contradicts the Prebisch-Singer thesis, which suggests a secular decline in terms of trade for primary product- exporting countries. The increase in terms of trade may be due to changes in global demand, improvements in productivity, and new export markets. Overall, we can say that global economic landscape has changed significantly since the formulation of the Prebisch-Singer thesis. Also, we can say that as the index of terms of trade increases, GDP also increases. But we have to remember that correlation doesn't always mean causation, and there might be other things affecting the relationship between these two variables. It is useful to employ methods such as granger causality or regression analysis to study these concepts in depth in future. However, it is important to highlight that GDP and terms of trade between agriculture and non-agriculture sectors share a significant relationship. Future studies could dwell on the role of Prebisch-singer thesis in a value chain dominated global context.

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# REFLECTIONS ON THE PERFORMANCE OF REGIONAL RURAL BANKS (RRBS) AND THE NEED FOR THEIR REVITALIZATION ON THE LINES OF ENHANCED ACCESS AND SERVICE EXCELLENCE (EASE)

Pradeep Kumar B

## Abstract

*The decline in the Credit-Deposit Ratio in Regional Rural Banks (RRBs) over the years and the consequent increase in investment by RRBs in government securities and other approved securities clearly show that RRBs have deviated from their stated objective to a greater extent. In fact, RRBs are expected to cater to the credit needs of rural areas, and the lack of institutional organized credit supply in rural areas needs to be tackled with the active involvement of RRBs in the lending process. But, owing to the changes happening in the banking field especially since the onset of reforms, many RRBs have failed to live up to this spirit. Against this background, the Government of India has started attempts to reform the RRBs on the lines of the EASE (Enhanced Access and Service Excellence). With EASE being introduced to revitalize the RRBs in tune with technological changes and customer requirements, RRBs may be able to retain their position as the frontrunner of rural institutional finance in India.*

**Key words:** reforms, financial feasibility, commercial banks, investment portfolios

## Introduction

The role of Regional Rural Banks in the rural and agricultural progress of the Indian economy has long been recognized in development literature. Although the RRBs have been sponsored by scheduled public sector commercial banks, they have shown their independent ability to cater to the emerging needs of the rural economy. Since the onset of banking sector reforms, RRBs have undergone visible deviations from their stated objectives in some spheres of their functions. In the environment of stiff competition, RRBs find it difficult to swim through the troubled waters as they do not have financial feasibility, and they do lend to highly risky areas (Ahmed, 2015).

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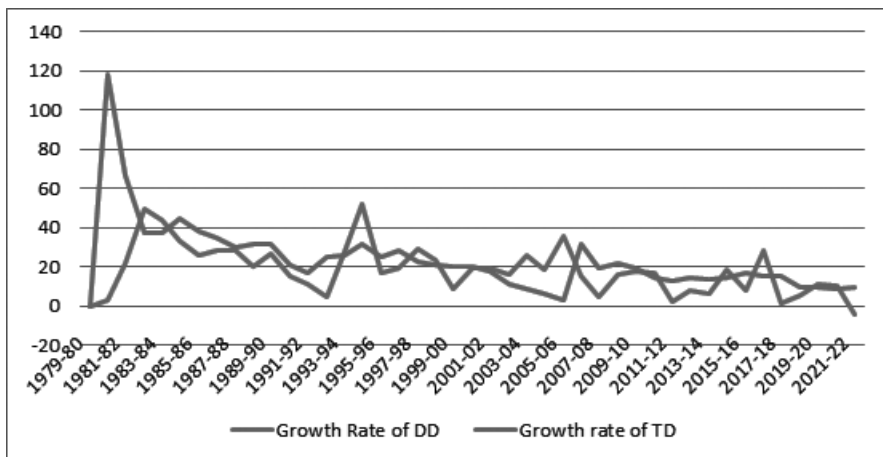
**Dr Pradeep Kumar B**, Associate Professor of Economics, Maharaja's College (Government Autonomous), Ernakulam.

Hence, the emerging financial atmosphere thanks to the growing intensification of financial sector reforms does not appear to be providing a level playing field for the RRBs even to sustain their business, not to speak of competing with other counterparts. Moreover, as RRBs are expected to work on the principle of low margins while engaged in lending, it appears absolutely hard for the RRBs to catch up with other entities in the organized financial sector (Antil, 2020). On account of these in-built reasons, RRBs have been less effective in serving their very purpose of meeting the credit needs to a greater extent (Tiwari, Jee, Sitaramaiah, & Kumar, 2019). Studies have also shown that the performance of RRBs did not turn towards sound financial management leading to the generation of profit (Reddy & Prasad, 2011). The core purpose of the RRBs has been to enhance the quality and quantity of the rural credit delivery mechanism (Misra, 2006). Against this background, this paper looks into the current status of the RRBs in India in terms of deposit mobilization and investment portfolios, and apart from this the paper also attempts to observe whether the RRBs have committed any deviation from their stated objective of financing rural credit needs. The paper also throws light on the possibility of revamping the RRBs by bringing EASE reforms into the sphere of RRBs. This study makes use of data available in the RBI database during the period from 1979-1980 to 2021-2022.

### **An Analysis of the Status of Deposit Mobilization by RRBs**

Like any other scheduled commercial bank, RRBs also accept deposits from people in the form of both demand deposits and time deposits. In absolute terms, both demand deposits and time deposits in RRBs have registered a tremendous growth during the period between 1979-80 and 2021-22. In 1979-80, RRBs received almost Rs. 72 crores each as both Demand Deposits and Time Deposits, but in the next year, 1980-81, time deposit mobilization marked a jump to the tune of Rs. 157 crores whereas demand deposits marginally improved to Rs. 74 crores. In 2020-21, the amount mobilized through time deposits stands at Rs. 466090 crores while funds that came through demand deposits stood at just Rs. 82222 crores. When it comes to the case of the growth rate of demand deposits and time deposits, it could be observed that both have shown oscillations in their trends over the period under consideration (Figure No.1).

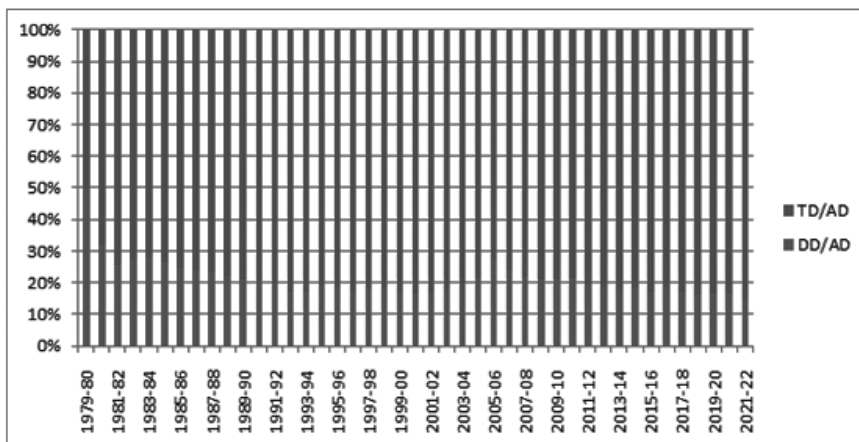
**Figure 1: Growth Rate of Demand Deposit and Time Deposit of RRBs**



Source: RBI Database

Moving onto the trend in the ratio of demand deposits and time deposits to aggregate deposits, it could be observed that the TD to AD has been quite high in the case of RRBs over the period 1979-80 to 2021-22 (Figure No.2). In recent times particularly in the 2000s, the trend has completely turned in favor of the time deposits.

**Figure 2: Trends in the Ratio of Demand Deposit to Aggregate Deposit (DD/AD) and Time Deposit to Aggregate Deposits (TD/AD)**

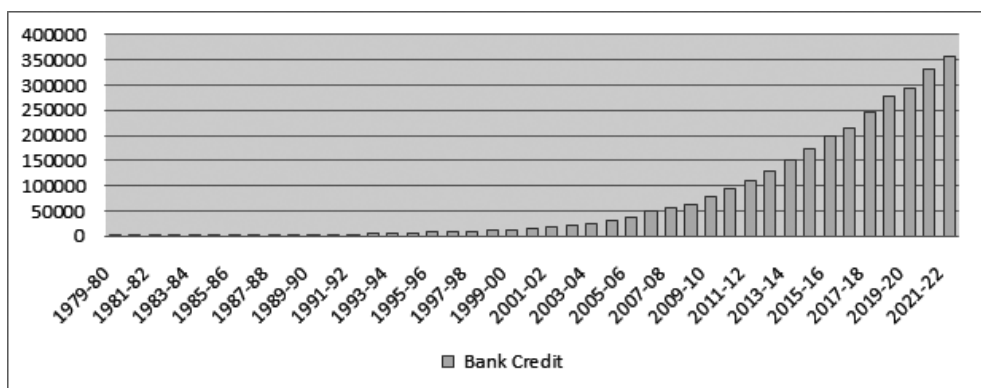


Source: RBI Database

## An Analysis of the Status of Credit Disbursal by RRBs

RRBs stand for ensuring the availability of tailor-made loans to farmers and others living in rural areas in India. Hence, RRBs are expected to allocate available credit judiciously to ensure that all those who deserve credit in rural areas receive it. Till 2007-08, total credit disbursement by the RRBs in India was below Rs.50000 Crores (Figure No.3). In fact, it needs to be noted that since 2007-08, the absolute amount of credit disbursed by the RRBs witnessed a heavy jump. In 1979-80, RRBs disbursed credit worth Rs.173 crores in rural areas whereas it increased to Rs.1134 crores in 1984-85, and to Rs.11016 crores in 1998-99. Further in 2011-12, the amount of credit allocation skyrocketed to Rs.111082 crores, and by 2021-22, it touched a level as high as Rs.357076 crores.

**Figure 3: Bank Credit by RRBs**

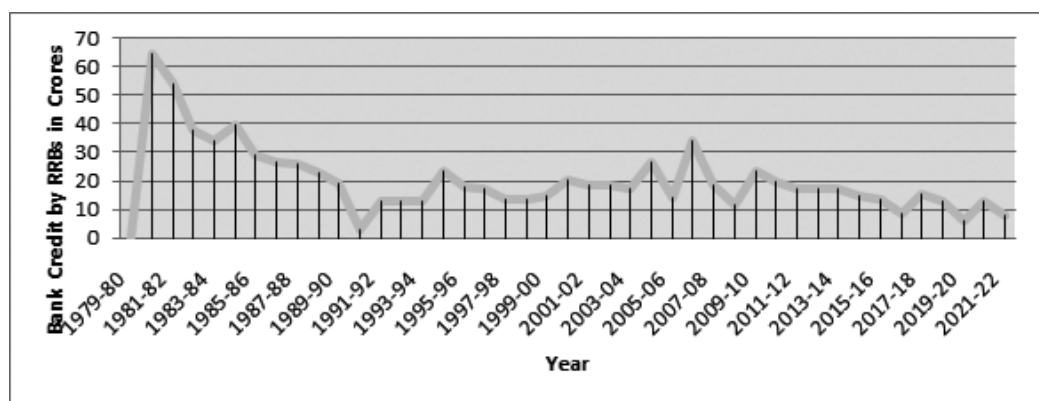


Source: RBI Database

Nonetheless, what deserves to be noted is the growth rate in the disbursal of credit over the period under consideration. It is interesting to note that the growth rate in the rural credit disbursement by the RRBs has never been encouraging given the growing requirements of the demand for rural credit. The growth rate in bank credit by the RRBs has actually been much more volatile in India. It has not kept pace with the growth in the demand for credit. For instance, after registering a growth rate to the tune of almost 64 percent in 1980-81, the growth continually slowed down to reach the lowest-ever rate of 2.58 percent in 1990-91 (Figure No.4). It boils down to the fact that during the pre-reform period

the growth rate in the disbursal of credit by the RRBs had never been encouraging on the expected lines. Although the rate of growth in the pre-reform period had declined, the annual average growth rate of bank credit by the RRBs stood at 35.38 percent. But in the 1990s, that is the ten immediate years that followed reforms, the average annual growth rate of bank credit fell to 14.13 percent, and further in the 2000s, that is during the period of second-generation reforms, although the growth rate slightly picked up to 20.24 percent, it has again declined to 13.36 percent in 2010 and in the first two periods of 2020s. In the post-liberalization period, the highest bank credit growth (34 percent) by the RRBs was registered in the year 2006-07 and the lowest growth (6.24 percent) was shown in the year 2019-20. Again it needs to be reiterated that the initial high growth of 64 percent recorded in 1980-81 has never been repeated again.

**Figure 4: Growth Rate of Bank Credit by RRBs During the period 1979-80 to 2021-22**



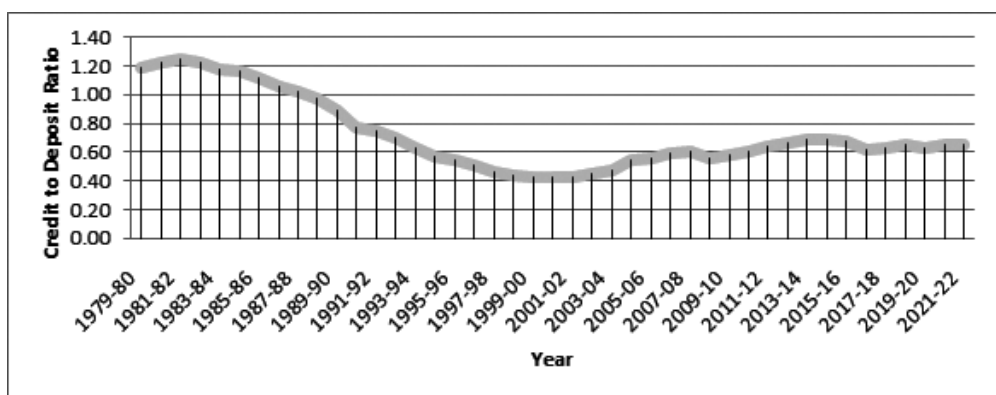
Source: RBI Database

### **Trends in the Credit to Deposit Ratio (C/D Ratio) of RRBs in India**

An important yardstick to evaluate the performance of banking institutions in the realm of lending operation is to gauge the trend in the credit-to-deposit ratio which simply means how much part of the deposit accepted by the banks is used for lending purposes. An increase in the credit-deposit ratio has been considered a positive sign of the better performance of banking institutions. During the entire period of 1979-80 to 2021-22, the highest C/D ratio by the RRBs was witnessed in the year 1981-82. Interestingly, the C/D ratio exceeded the crucial limit of 1

during the period 1979-80 to 1987-88. Since 1988-89, the C/D ratio by the RRBs has been lying far below 1, which itself shows that the initial momentum in the case C/D ratio has not been kept by the RRBs in later years. The smallest ever C/D ratio of 0.42 was repeatedly witnessed in 1999-2000, 2000-01, and 2001-02 (Figure No.5). Since 2001-02, the C/D ratio of RRBs started picking up gradually. The worst performance of RRBs in respect of the C/D ratio took place in the period 2000-01 to 2009-10, the period of so-called second-generation reforms in the Indian economy. Hence, going by the data of the C/D ratio, it can be concluded that RRBs have not been performing on the expected lines.

**Figure 5: Credit to Deposit Ratio of Regional Rural Banks**



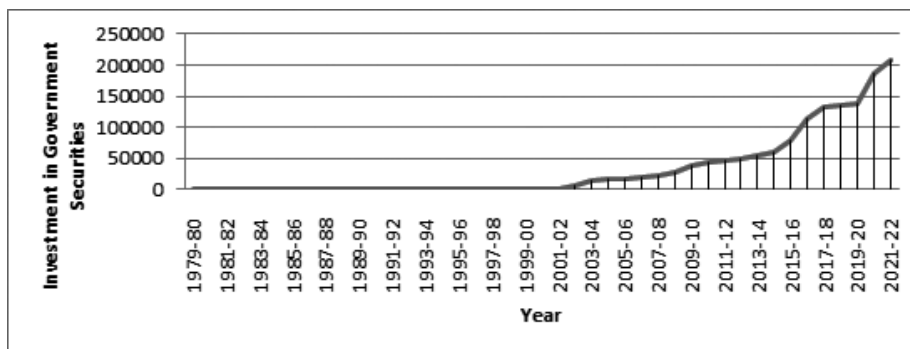
Source: RBI Database

### **Investment in Government Securities: Is it a deviation from the stated goals of RRBs?**

The decline in the C/D ratio of RRBs in recent times should be read along with an increasing trend in their investment in government securities (IGS) and in other approved securities (IOAS). Interestingly, investment in Government Securities by RRBs has shown an increasing trend since 2001-02 (Figure No.6). Compared to IGS (investment in government securities), the investment in other approved securities (IOAS) by the RRBs has not been so high (Figure No.7). It is quite worthy of mentioning that only during the period 1993-94 to 2009-10 that the investment in other approved securities had shown both increasing and decreasing trend (Figure No.8).

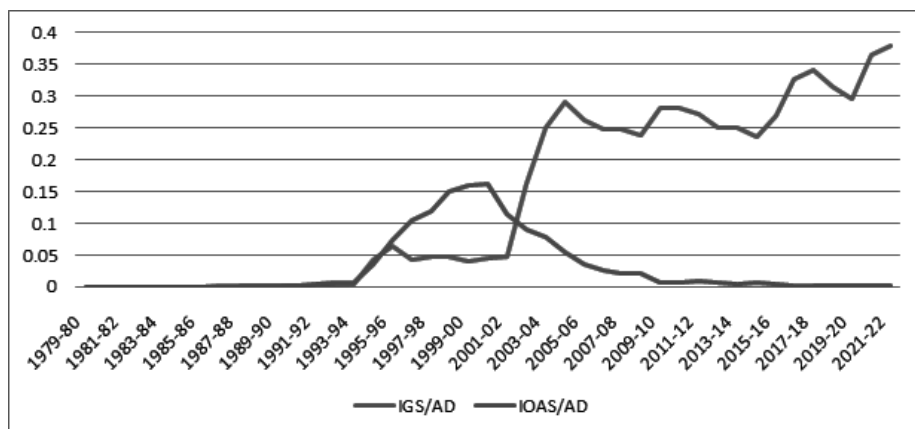


**Figure 6: Investment in Government Securities by RRBs**



Source: RBI Database

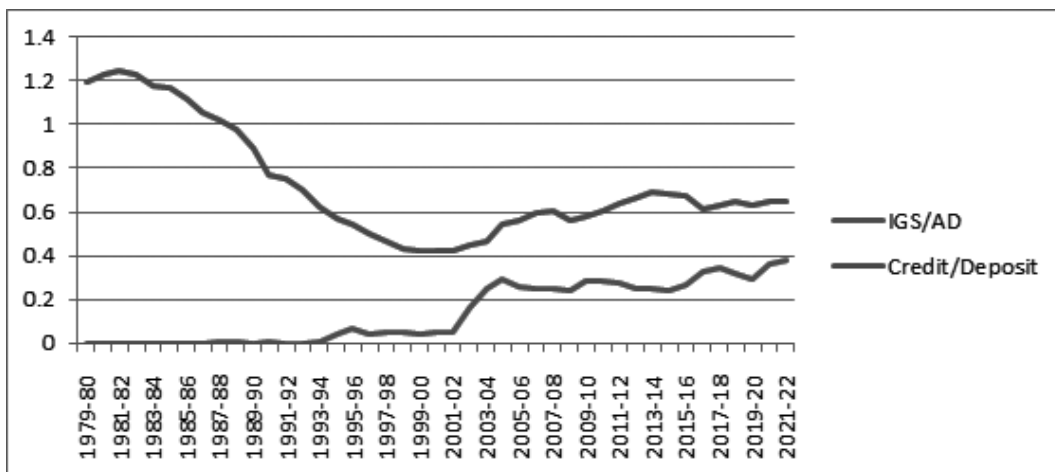
**Figure 7: Comparative Analysis of IGS/AD and IOAS/AD**



Source: RBI Database

Having seen the increasing trend of investment in government securities by the RRBs, now it would be interesting to examine the comparative difference in the trend of Investment in Government Securities and Credit disbursement as a ratio of deposits. The IGS/AD started rising from 1993-94 whereas the Credit/Deposit ratio had commenced its falling trend from 1981-82 itself. Nevertheless, the C/D ratio has always been higher than the ratio of IGS/AD (Figure No.8). The declining CD ratio and the gradual replacement of it by the ratio of IGS/AD apparently point towards the fact that the RRBs have been slightly deviating from their stated objective of lending enormously to the rural sector in an attempt to uplift the economic activities and living conditions of rural people.

**Figure 8: Comparative Trend in IGS/AD and Credit/Deposit of RRBs in India**



Source: RBI Database

## Conclusion

As several studies show, RRBs have been under severe pressure as they do not appear to have been making viability, feasibility, and profitability in their banking operations including both accepting and lending money to the neediest rural populations. This is partly due to not treating RRBs at par with other commercial banks. Against this background, it has been reported that the Government of India has started attempts to reform the RRBs on the lines of the EASE (Enhanced Access and Service Excellence) initiative that aims at equipping Public Sector Banks to be smart and clean banks(Dev, 2022). The recently revamped EASE has two components. One is a common thing applicable to all banks, but the second one is bank-specific medium-term action(Pattanayak, 2022). The common reform agenda aims to enable the banks to respond to changing customer requirements, competition, and technological changes. Bank-specific medium-term plans can be more advantageous to the interest of the RRBs. Thus, with EASE being introduced to revitalize the RRBs in tune with technological changes and customer requirements, RRBs may be able to retain their position as the frontrunner of rural institutional finance in India.

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# HISTORICIZING DISABILITY: A MARGINALISATION CONTEXT

Bhavanamol.R

## **Abstract**

*The term 'disability' is very enigmatic. There is as of now, no consensus in defining the term 'disability'. Several studies and academic inquisitions have been sprouting out concerning disability from different dimensions. The twentieth century had witnessed the emergence of a separate realm of studies concerning the aspects of disability and it provided a platform for delving more pertaining to the condition of disability. Presently disability studies has evolved as a vital platform of discussions, debates, criticisms, and deliberations about different aspects of disability and its pertinence in the contemporary world. Though the condition of disability is not defined uniformly by scholars, academicians and policy makers, the term has obtained a kind of refinement through the development of different models of disability such as medical model and social model. The term disability has its own historical patterns and perspectives. A historical account can unveil various changes in approaching the condition of disability in different phases. This study attempts to provide an introduction about the historical patterns of the term 'disability' through adopting the method of narrative overview.*

**Keywords:** *Disability Studies, Historical Patterns, Medical Model, Social Model.*

## **Introduction**

The term disability has been defined differently. There are different approaches and models to disability. The term "Disability" has been connoted differently based on its contexts. While the social context focuses on issues like prejudice, the medical context utilizes a diagnostic- therapeutic paradigm (Stanford Encyclopedia of Philosophy). World Health Organisation (WHO) has defined disability as a condition which results from the interaction between individuals with a health condition, personal and environmental factors.

The identification of disablism as a specific form of social oppression stems from the subordination of people because of their impairment (Barnes&Mercer,2003). One of the important aspects of oppression is marginalisation. Marginalisation

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refers to the systematic removal of a social group from the mainstream of everyday life, and includes material disadvantages, exclusion from the division of labour, institutional segregation, and denial of citizenship rights. Disabled people are different from non-disabled people.

Disabled people are an oppressed group, and often non-disabled people and organisations such as professionals and charities are the causes or contributors to that oppression (Shakespeare, 2006). While the problems of disabled people have been explained historically in terms of divine punishment, karma or moral failing, and post-enlightenment in terms of biological deficit, the disability movement has focused attention onto social oppression, cultural discourse, and environmental barriers. In many countries of the world, disabled people and their allies have organised over the last three decades to challenge the historical oppression and exclusion of disabled people (Campbell & Oliver, 1996).

It is essential to understand how the approach to the condition of disability has been changing over the time. This paper is about various perspectives towards the condition of disability.

## **Objectives**

The objectives of this study are

- To understand different conceptual models of disability
- To understand historical patterns and perspectives of the condition of disability

## **Method**

Since this study attempts to provide an outline understanding on different ways of approaching the disability condition and its historical patterns, it has used the literature review research design. This study used the method of narrative overview or the unsystematic narrative review. The sources of information this study made use were journal articles and books. It reviewed articles and books related to the aspects and objectives under investigation extensively and provided a narrative overview.

## **Conceptual Models of Disability**

There are different disability models and each of them has its own perspectives regarding the term disability. Models are ways of translating ideas into practice and the idea underpinning the individual model was that of personal tragedy, while the idea underpinning the social model was that of externally imposed restriction (Oliver, 2004).

### **❖ Moral Model**

This model considers disability as an act of God and It is the oldest disability model (Retief & Letsosa, 2018). It is also known as religious model. According to this model, disability should be regarded as a punishment from God for a particular sin or sins that may have been committed by the persons with disabilities (Retief & Letsosa, 2018).

### **❖ Medical model**

The medical model (individual model) considers disability as a problem of the individual that is directly caused by a disease, an injury or other health conditions, and requires prevention interventions or medical care in the form of treatment and rehabilitation (Mitra, 2018). This model considers disability as a disease (Retief & Letsosa, 2018). It is also known as personal tragedy model. According to this model, disability is regarded as objectively bad, as a pitiable condition, 'a personal tragedy for both the individual and her family, something to be prevented and, if possible, cured' (Carlson, 2010).

### **❖ Charity Model**

This model considers disability as victimhood (Retief & Letsosa, 2018). The charity model sees persons with disabilities as victims of their impairment and their situation is tragic, and they are suffering (Duyan, 2007). According to the charity model, persons with disabilities are victims of circumstances who should be pitied (Retief & Letsosa, 2018).

### **❖ Social Model**

The alternative to the individual model-initially outlined by Michael Oliver-is the social model which sees disability as exclusively caused by social constraints

(Qizilbash, 2011). It is also known as minority model. It actually considers disability as a socially constructed phenomenon (Retief & Letsosa, 2018). The social model emerged from the intellectual and political arguments of the Union of Physically Impaired Against Segregation (UPIAS) (Shakespeare, 2006). UPIAS was a small, hardcore group of disabled people, inspired by Marxism, who rejected the liberal and reformist campaigns of more mainstream disability organisations such as the Disablement Income Group and the Disability Alliance (ibid). The aim of UPIAS was to replace segregated facilities with opportunities for people with impairments to participate fully in society, to live independently, to undertake productive work and to have full control over their own lives.

According to Social Model of disability, it is society which disables physically impaired people. Disability is something imposed on top of our impairments; by the way we are unnecessarily isolated and excluded from full participation in society (ibid). Disabled people are therefore an oppressed group in society. The social model is distinguished from the medical or individual model. Whereas the former defines disability as a social creation—a relationship between people with impairment and a disabling society—the latter defines disability in terms of individual deficit (ibid). The social model demonstrates that the problems disabled people face are the result of social oppression and exclusion, not their individual deficits. This places the moral responsibility on society to remove the burdens which have been imposed, and to enable disabled people to participate. The social model has been effective psychologically in improving the self-esteem of disabled people and building a positive sense of collective identity.

#### ❖ **Human Rights Model**

It considers disability as a human rights issue which bears close affinity to the social model of disability (Retief & Letsosa, 2018). This model offers a theoretical framework for disability policy that emphasises the human dignity of people with disabilities and constructive proposals for improving the life situation of them (Degener, 2017).

#### ❖ **ICF Model**

International Classification of Functioning, Disability and Health (ICF) model was developed by the World Health Organisation (WHO). It is a revised form of the

International Classification of Impairments, Disabilities and Handicaps (ICIDH). ICF is a blend of both medical model and social model. According to this model, disability is the result of the combination of two factors such as environment and health condition.

### **Historical Patterns and Perspectives**

For most of the twentieth century in 'Western' societies, disability has been equated with 'flawed' minds and bodies (Barnes&Mercer, 2003). The individual's impairment or 'abnormality' necessitates dependence on family, friends and welfare services, with many segregated in specialized institutions. Disability amounts to a 'personal tragedy' and a social problem or 'burden' for the rest of the society. However, from the late 1960s, this orthodoxy in thinking and practice became the target of campaigns across Europe and North America. Disabled activists and organizations of disabled people were united in condemning their status as 'second-class citizens' (Eisenberg, et al, 1982). They redirected attention to the impact of social and environmental barriers, such as inaccessible buildings and transport, discriminatory attitudes and negative cultural stereotypes, in 'disabling' people with impairments (Bowe, 1978). For most of the twentieth century, this personal tragedy approach was applied in a variety of educational and charitable institutions and through medical and psychological interventions (Barnes&Mercer, 2003).

Until recently, there have been few historical studies of disability, and existing contributions have been criticized as lacking theoretical sophistication or extensive empirical grounding (Bredberg, 1999). Most stress the continuity of negative attitudes and practices towards those with perceived impairments, although some identify signs of more liberal and humanitarian attitudes and policies towards disabled people, at least in modern times (Barnes&Mercer,2003).

Histories of disability often start their journey in ancient Greece with its idealization of body shape and fitness linked to acceptance of infanticide for those born with visible impairments. The dread of impairment is reinforced by examples drawn from the Bible suggesting that it is a punishment for past sins. The negative picture gathers further corroboration in the denunciation of newly born children with impairments as 'changelings', or inhuman beings substituted by the Devil, by a continuous line of medieval clerics from St Augustine to Martin



Luther. There is also ample evidence that everyday life and popular culture were permeated with views that associated impairment with evil and wrongdoing and as a source of ridicule, fear and pity (Thomas, 1982). Henri-Jacques Stiker's (1999) grand historical journey provides enough evidence to convince that oppression is not universal or consistent experience for people with impairment.

A few attempts have been taken place to explore a material basis to this changing historical detail. The work 'Attitudes and Disabled People' by Vic Finkelstein was one of the first attempts that outlines a historical materialist account. There are three main economic-technological phases that show qualitative changes in social responses to impairment. They are Pre-industrial (feudal society), industrial Capitalism, and Post-industrial society.

### **Pre-industrial phase**

In this phase activity is agrarian and cottage phased. Feudal social relations focused more on subsistence than wealth generation and accumulation, so that 'disabled people were regarded as individually unfortunate and not segregated from the rest of society' (Oliver,1990). At the same, 'peasant households could not afford to consider any bodies as unproductive' (Gleeson, 1999). It was accepted that differences in individual economic performance might force people to change work to accommodate their impairment, rely on begging and charity alms, or in the case of older disabled people unable to work, they might provide shelter to others in return for personal support (Pelling,1998).

### **Industrial Capitalism**

The second phase of a qualitative shift in responses to impairment is industrial capitalism. This phase relates to the establishment of industrial capitalism in nineteenth century Europe and North America. Mike Oliver (1990) states that with the rise and entrenchment of capitalism, disability had socially been created as a personal tragedy. Both Finkelstein and Oliver highlight the spread of a free market economy, wage labour, and the change to mechanized systems of production (Barnes&Mercer, 2003). 'The speed of a factory work, the enforced discipline, the time-keeping and production norms-all these were a highly unfavorable change from the slower, more self-determined and flexible methods

of work into which many handicapped people had been integrated'(Ryan&Thomas,1980).

This build-up of constraints on the employment of people with impairments led to the increased displacement of 'unproductive' disabled workers from the workplace, although this process was uneven and drawn out, rather than sudden (Barnes&Mercer,2003). The person with impairment was at a disadvantage because of the decline of traditional, local community and family-based support systems and values, and the rising importance of geographical mobility to find employment. By contrast, the rapidly expanding industrial towns and cities appear far less accommodating to disabled people. A case study of nineteenth-century Melbourne in Australia demonstrates a growing 'socio-spatial marginalisation of disability (Gleeson, 1999).

### **Post-Industrial Society**

The emergence of a post-industrial society had occurred in the second half of the twentieth century, with the new, computerized, information technology identified as the harbinger of significant social and economic changes (Barnes&Mercer, 2003). Finkelstein (1980) interprets this as bringing altogether more positive opportunities for the inclusion of people with impairment in paid employment, so allowing 'the most severely physically impaired people to live relatively independently in the community'.

In the 1990s, fresh momentum was given to claims about significant changes in late twentieth-century capitalism (ibid). Manuel Castells (1996) is one of those who argues that there has been a notable shift away from manufacturing and service industries towards 'informationalisation' and an increasing global economy. From a non-Marxist perspective, Gary Albrecht (1992) also draws links between economic and technological changes and historical shifts in disability (Albrecht,1992). He categorizes societies according to their technological subsistence base into hunting and gathering, pastoral, horticultural, agrarian and industrial (with post-industrial and post-modern stages) (Barnes&Mercer,2003).

It was in the second half of the twentieth century that separate disability policies and growing numbers of disabled people dependent on services and benefits became established features of social welfare systems. The search for alternative

support for disabled people underpinned the introduction of 'normalization' policies. The philosophy and practice of normalization stressed the aim of assisting individuals into 'socially valued life conditions and socially valued role' (Wolfenberger & Thomas, 1983). It is the combination of material disadvantages, powerlessness and demeaning cultural stereotyping that marks out disabled people's experience of social oppression (Barnes & Mercer, 2003). Their marginalization acquires a new intensity with the maturation of industrial capitalism, which also came to colonize disabled people's lives in new ways. Even where disabled people's support needs were identified, this led to renewed medicalization and control of their lives by charities and professionals in ways that continue to instill dependence and frustrate attempts to live more autonomous lives.

## **Conclusion**

Historical accounts provide a wide understanding concerning the term disability and the various approaches to disability in different phases. Ultimate idea that one gets from passing through these literatures and historical accounts is that people with disability have become vulnerable to social oppression, especially marginalisation. Mainframe of the society has been viewed as a platform that is forbidden to disabled people. Disabled people are one among the marginalised segments of the society and disabled-friendly policies and changes in our society is very inevitable since they are also eligible to lead a life of worth, value and dignity.

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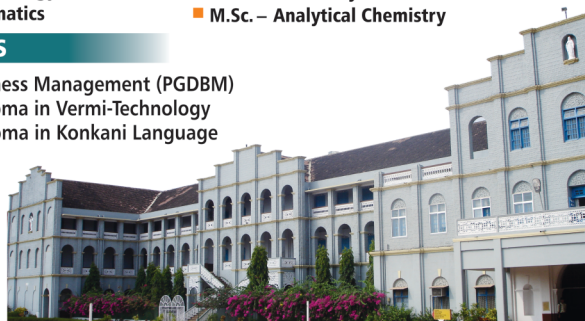
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