

Mathematical Experience and Making Values in History

- Math Practice Team, IFP

Mathematical Practice as work

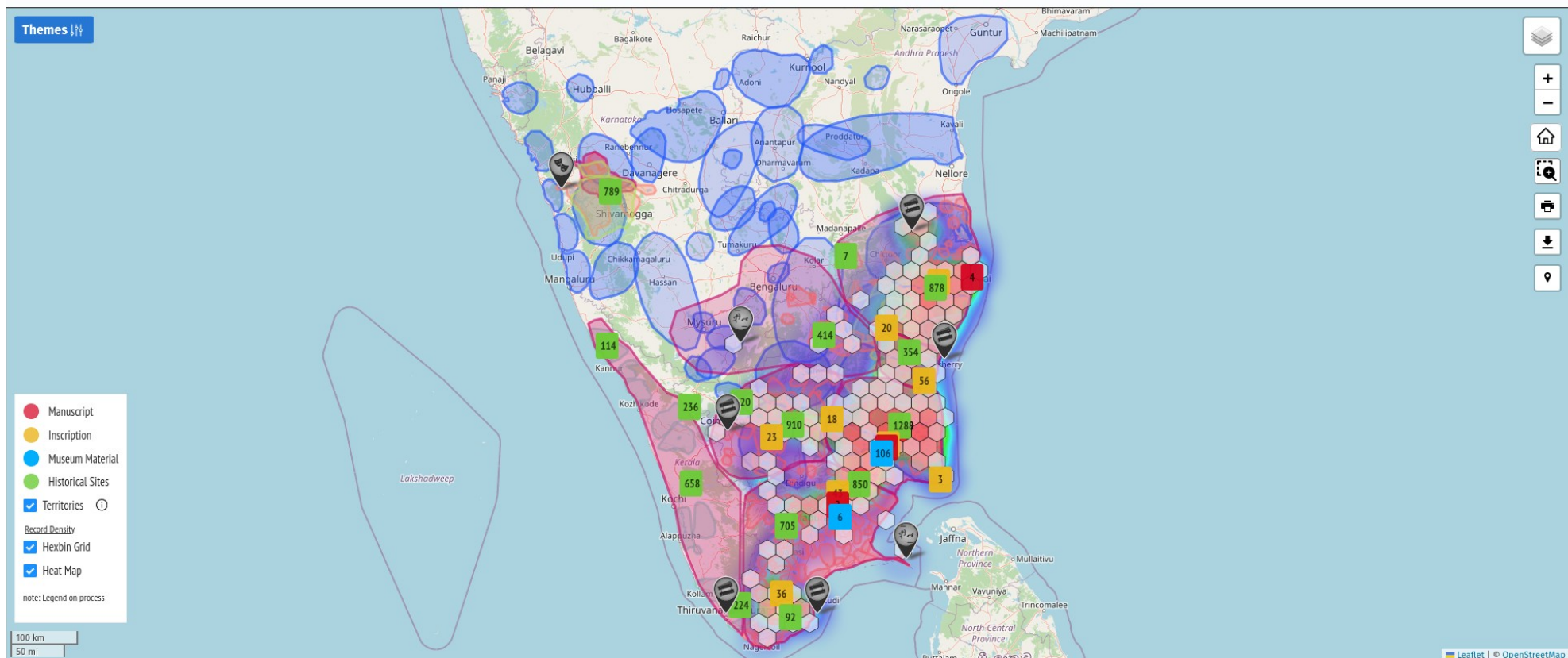
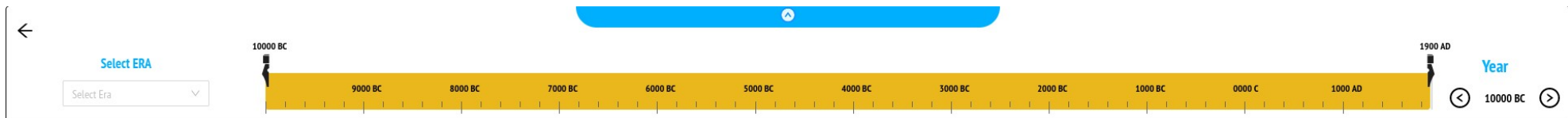
- Hegemonic histories render privilege to activities of the mind
 - The Bhata-Bhaskara Tradition in the history of Indian Mathematics
- Serve a political function in a society where occupation is caste based
- Different modes of abstraction in and across occupations
- Orders of abstraction & Hierarchy in the Social

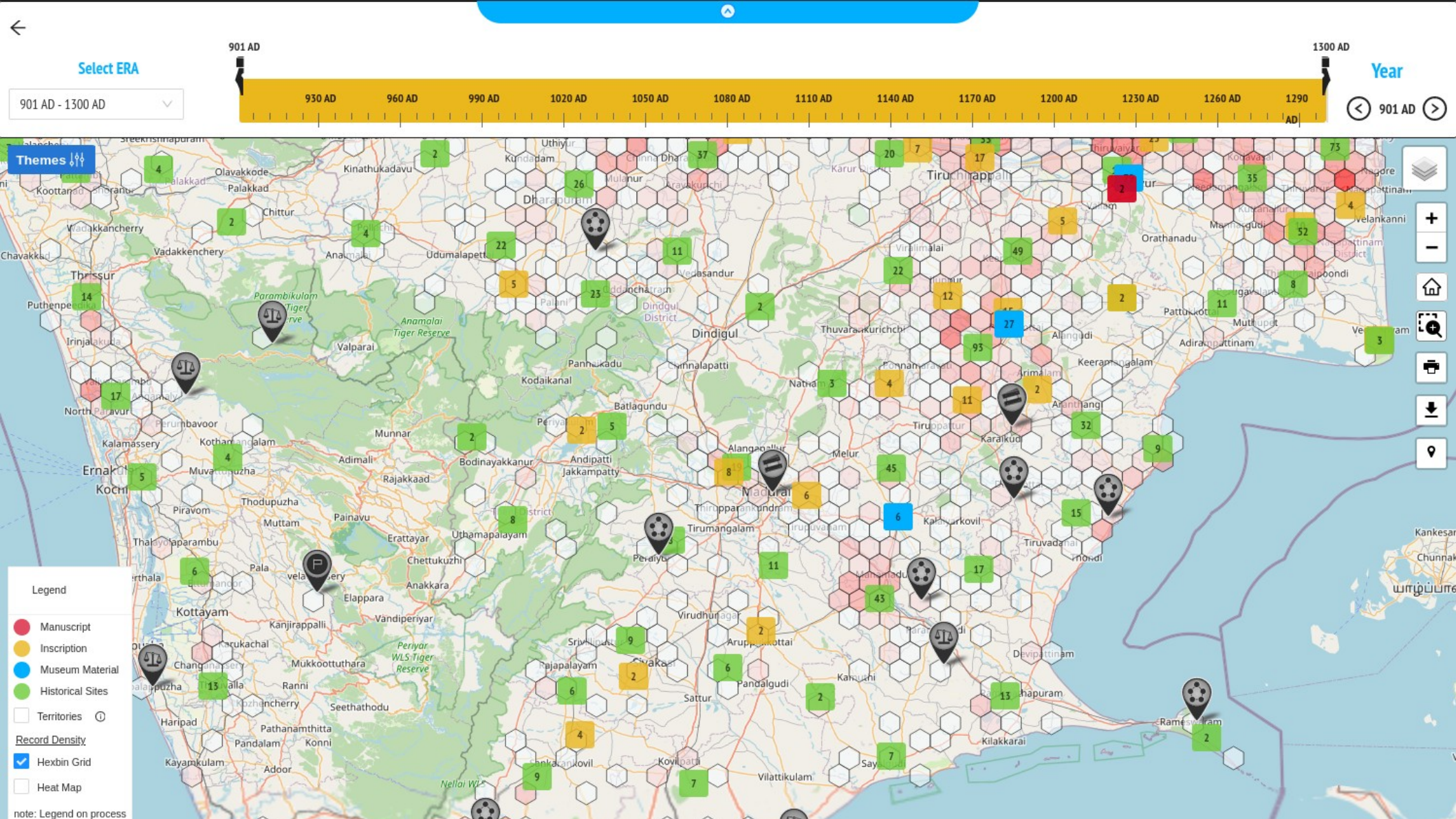
Our programme is to bring hand and mind together to reconstruct a different history of mathematics

- not any one particular language (all Indian languages)
- not any one practice (agrarian, mercantile, bureaucratic)
- practitioners in *time and place*
- texts as records of practices

Thus, Social history of mathematical practices

Atlas



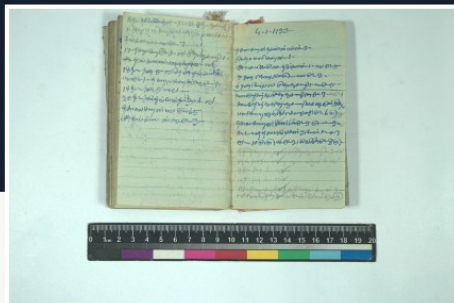


Available Thematics



Categorizing the available records i.e, digitized media, curated items, collections, etc ... always have cross overs, overlapping, mergers. Even with semantic tools, and methods that emphasize categorization based on available details, every catalogue and archive has to reach a limitation - at one end beyond which categories eventually becomes the data records itself, or else super categories that doesn't aid meaning at all in the other end.

Here we have provided the above topics that provide a context based short hand query into the database returning records that satisfy the condition. Further subtheming is a work in progress that eventually records more scholarly input into the media records that expresses more about the content, commonalities, relationships, differences, etc... where the linkages can be taken advantage of to recommend other similar records from one category to the other. So far, Omeka S - has provided us a convenient way of channeling the visitors to particular themes by grouping the synchronized digitized media with meaningful metadata vocabulary, into items sets and then into separate sites wherever possible.



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பீன் பிடி கணக்கு

UNIFORM TITLE
mīṇ piṭi kaṇakku

SUBJECT/CATEGORY
Accounts

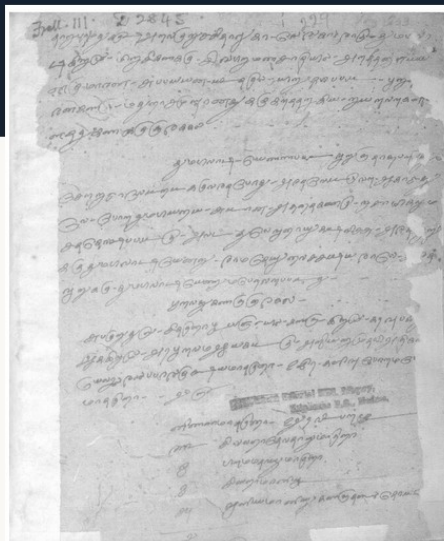
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Grama Kanakku

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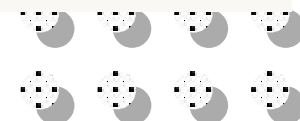
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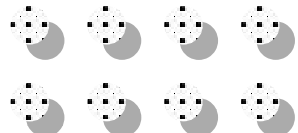


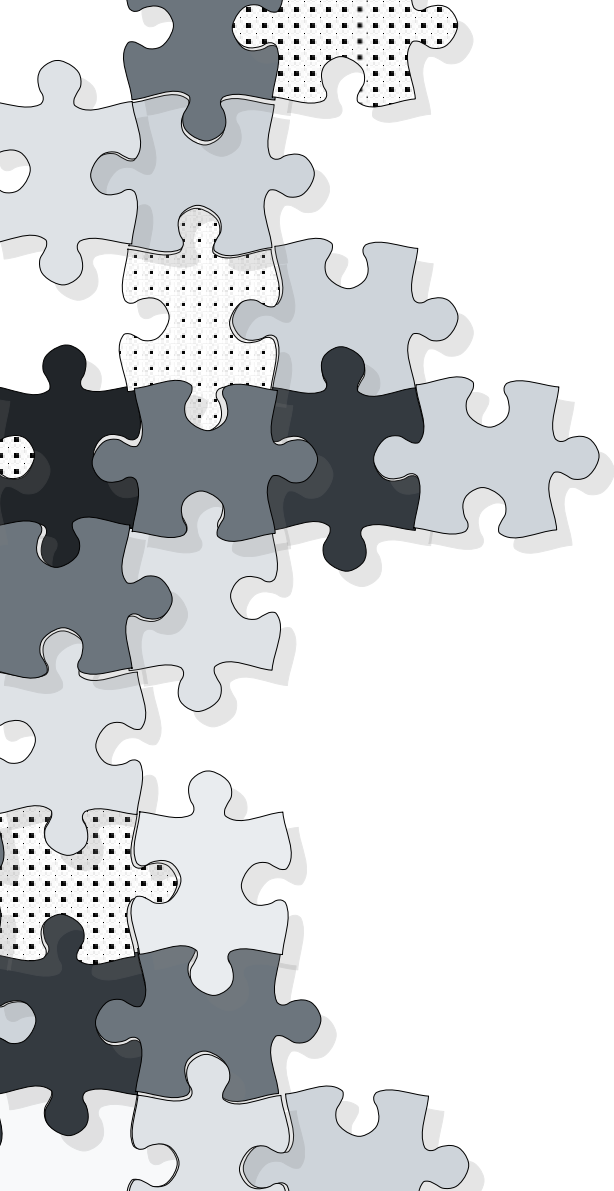
Mathematical Practice as work

- Mathematical practice as abstraction would mean:
 - *liberation ?*
 - *prescriptive knowledge*
 - *codification – texts as records of somebody else's practice, erasing caste*
 - *symbolization – a convenience, ritualization made ahistorical.*
- **For us, Mathematical practice hides value making**

Historical Cases

1. [15th Century, Europe]
 - Money as Measure of value
2. [12th Century, South India]
value
 - Measuring Rod & Manipulation of value
3. [16th Century, South India]
 - Pearls, Sieves, & Tables of value
4. [21st Century, Working women]
 - Measuring Trust & Extraction of value





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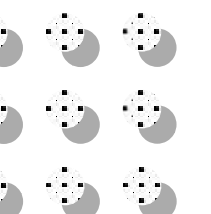
Finally we shall place the sun at
the center of the universe ...

”

- *Copernicus*

Money as Measure of Value





The Copernican Revolution – all happened in the mind

I shall not try to explain here the reasons and causes that produced the spiritual revolution of the sixteenth century. It is for our purpose sufficient to describe it, to describe the mental or intellectual attitude of modern science.

- Alexandre Koyré

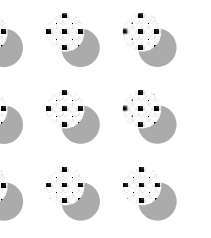
It was a revolution beside which the French Revolution was a child's play, a world struggle beside which the struggles of the Diadochi appear insignificant. Principles ousted one another, intellectual heroes overthrew each other with unheard-of rapidity. All this is supposed to have taken place in the realm of pure thought.

- Karl Marx and Friedrich Engels

Neoplatonism is explicit in Copernicus's attitude toward both the Sun and mathematical simplicity. It is an essential element of the intellectual climate that gave birth to his vision of the universe .. The new paradigm [...] emerges all at once, sometimes in the middle of the night, in the mind of a man deeply immersed in crisis.

- Thomas Kuhn





Money as Measure of Value

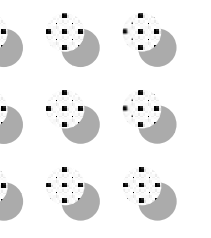
Copernicus as Church Official, advisor to the king of Poland & an Astronomer

- Measuring Heavens
- Measuring Land
- Measuring Value

Mathematician speaks to the King.

Why study Measurement as Work, *historically* ?

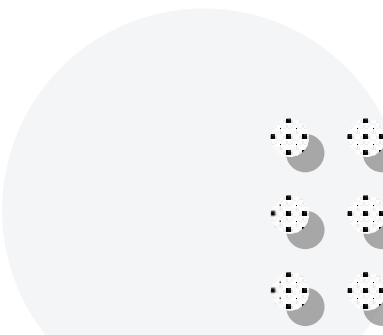
- offers justice and fairness in spaces that are constitutively unequal
 - idea of standard (gold, circle)
 - embodies hierarchy and power
- 



Money as Measure of Value

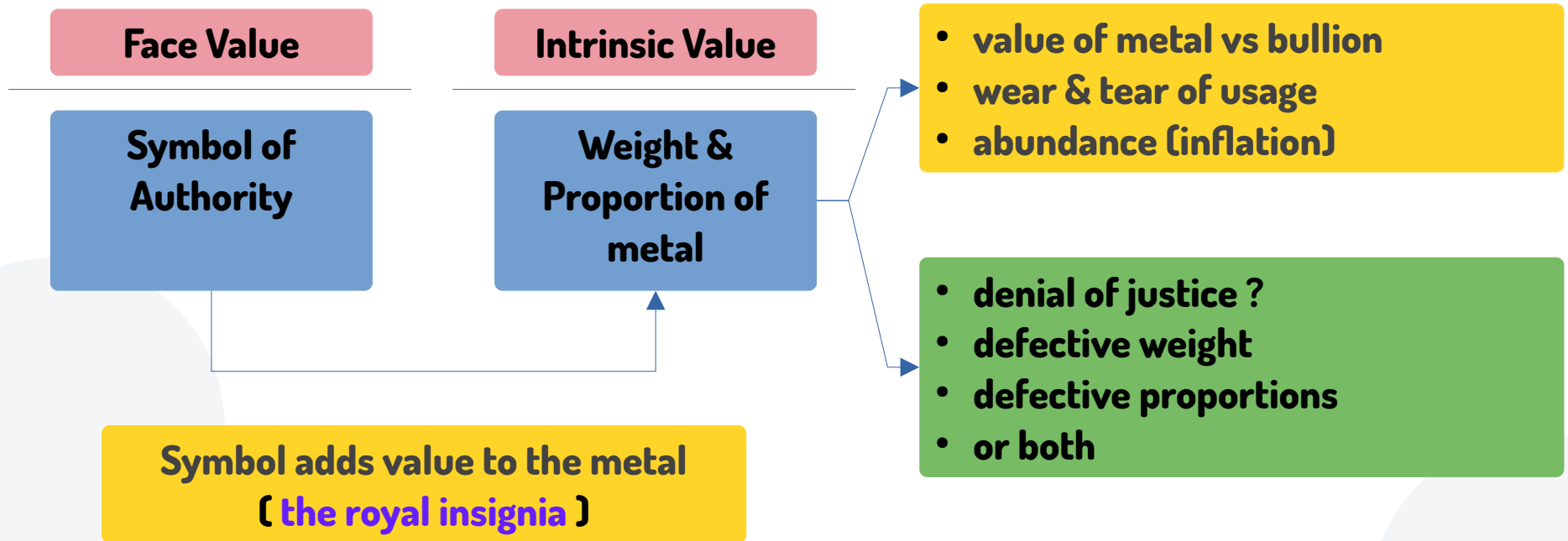
Copernicus as Church Official, advisor to the king of Poland & an Astronomer

Imagine a 16th Century Demonetization

- Debasement of the Coinage as the vexing problem, of the peasantry.
 - Uniform currency across Prussian and Polish territories, concern for the Polish King
 - Copernicus writes: *Monetæ cudendæ ratio* (Treatise on Money)
- 

Money as Measure of Value

Copernicus on Coinage



Money as Measure of Value

New coin

Old Coin

same weight but different value

- based on proportion of silver, gold
- changing market value of metal
- the new coin should replace the old coin completely
 - *“... where cheap money prevails, through listlessness, lethargy, and slothful idleness the development of the fine arts as well as of the intellect is neglected, and the plentifulness of all goods is also a thing of the past.”*
- gold and silver foundation of money on which its value rest
- measure must always preserve a common and fixed standard (like the yard, bushel, pound ,...)
- “Florin” – the Prussian gold standard
- Royalty as the agency for political unity, by ensuring the unity of the social
 - by guaranteeing establishment and maintenance of standard

Money as Measure of Value

Copernicus & the Cosmopolitical order :

At rest, however, in the middle of everything is the sun. For in this most beautiful temple, who would place this lamp in another or better position than that from which it can light up the whole thing at the same time?

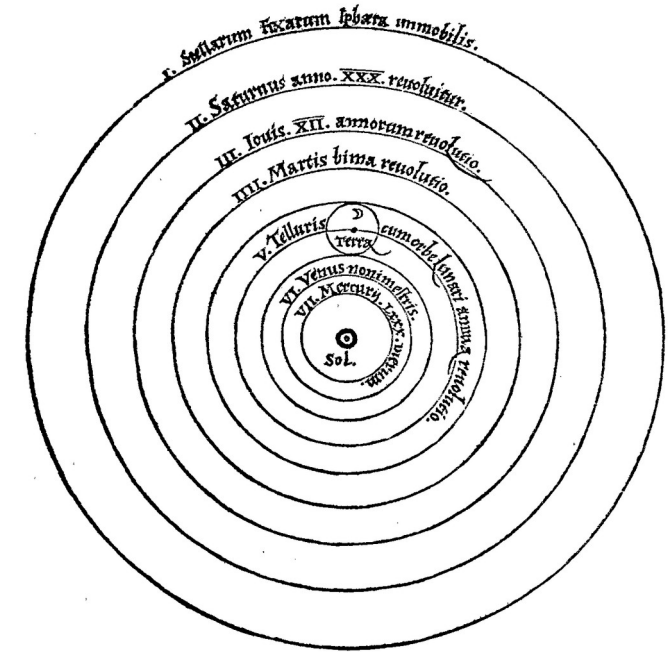
[...] Thus indeed, as though *seated on a royal throne*, the sun governs the family of planets revolving around it. [...] Meanwhile the earth has intercourse with the sun, and is impregnated for its yearly parturition.

[...] these two coinages should be of single standard, intrinsic value, and face value, and remain forever, under the watchful supervision of the leaders of the State ...

In this arrangement, for him, *in case of the heavens*, we discover a marvelous symmetry of the universe, and an established harmonious linkage between the motion of the spheres and their size, such as can be found in no other way. *In the case of money*, the king should be at the centre, ensuring royal control throughout the entire kingdom

NICOLAI COPERNICI

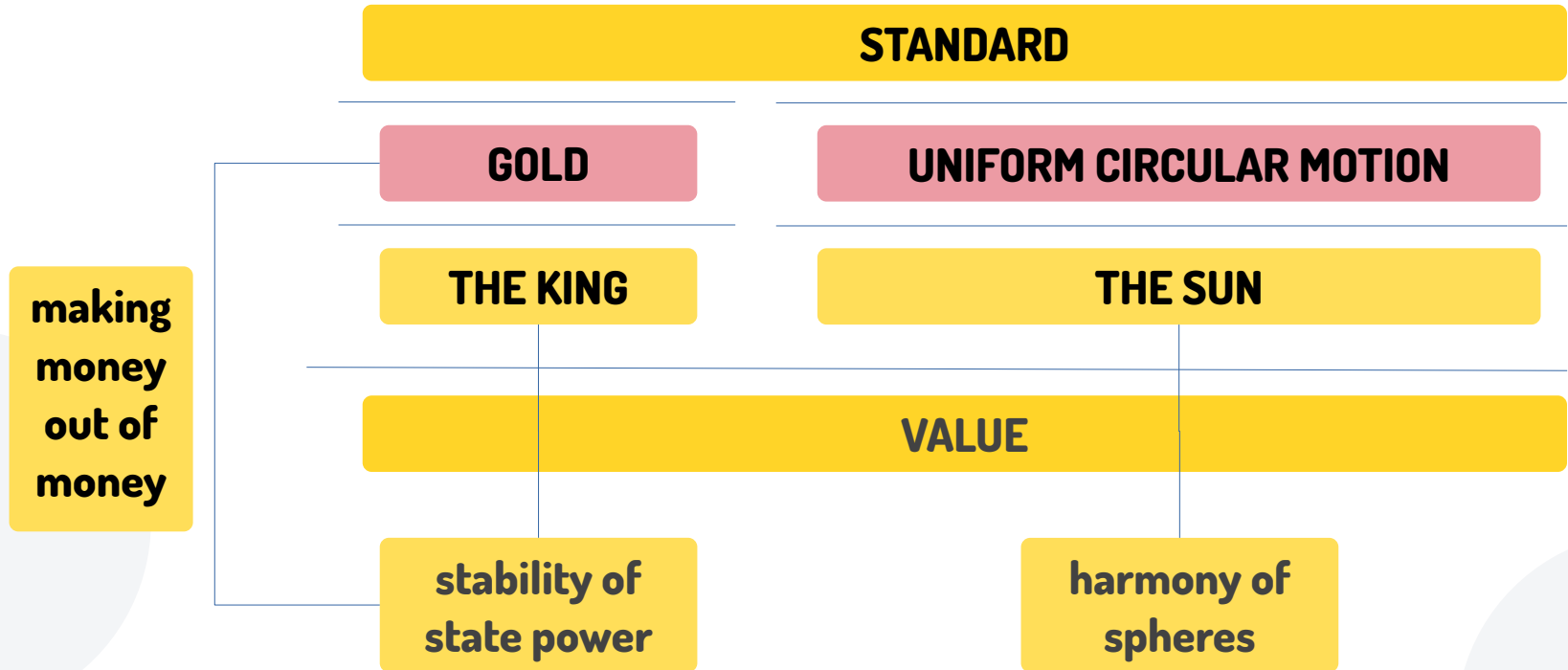
net, in quo terram cum orbe lunari tanquam epicyclo contineri diximus. Quinto loco Venus nono mense reducitur. Sextum denique locum Mercurius tenet, octuaginta dierum spacio circum currens. In medio uero omnium refidet Sol. Quis enim in hoc

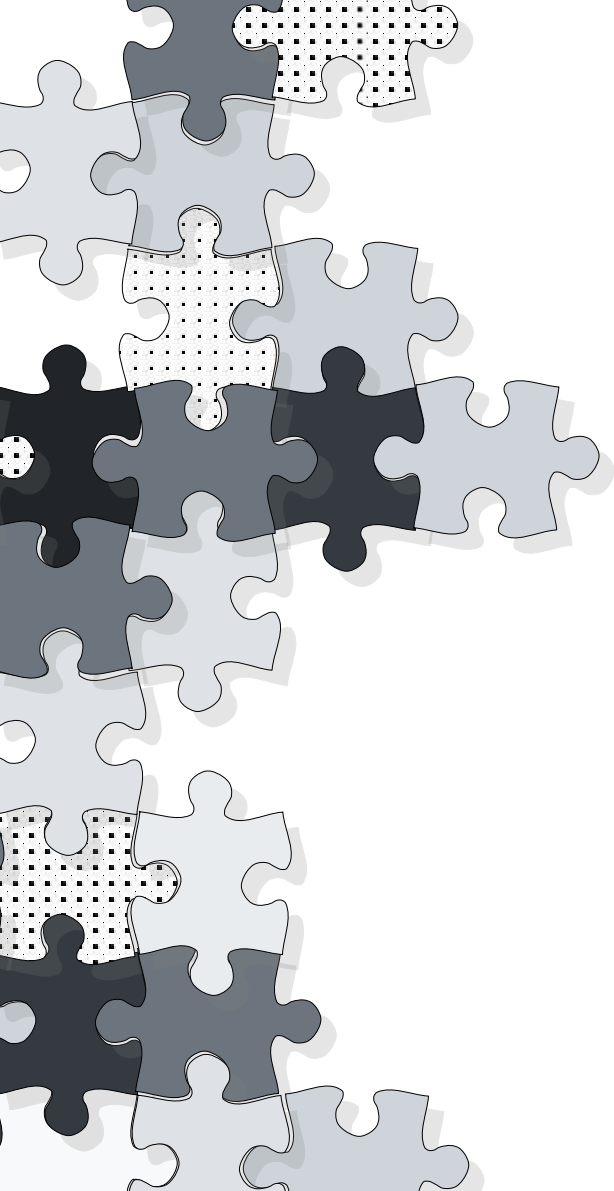


pulcherimo templo lampadem hanc in alio uel meliori loco poneret, quam unde totum simul possit illuminare? Siquidem non inepte quidam lucernam mundi, alij mentem, alij rectorem uocant. Trimegistus uisibilem Deum, Sophoclis Electra intuentem omnia. Ita profecto tanquam in folio regali Sol residens circum agentem gubernat Astrorum familiam. Tellus quoque minime fraudatur lunari ministerio, sed ut Aristoteles de animalibus ait, maximam Luna cum terra cognationem habet. Concipit interea a Sole terra, & impregnatur annuo partu. Inuenimus igitur sub hac

Money as Measure of Value

Copernicus & the Cosmopolitical order :





“Measuring Rod & Manipulation of value”

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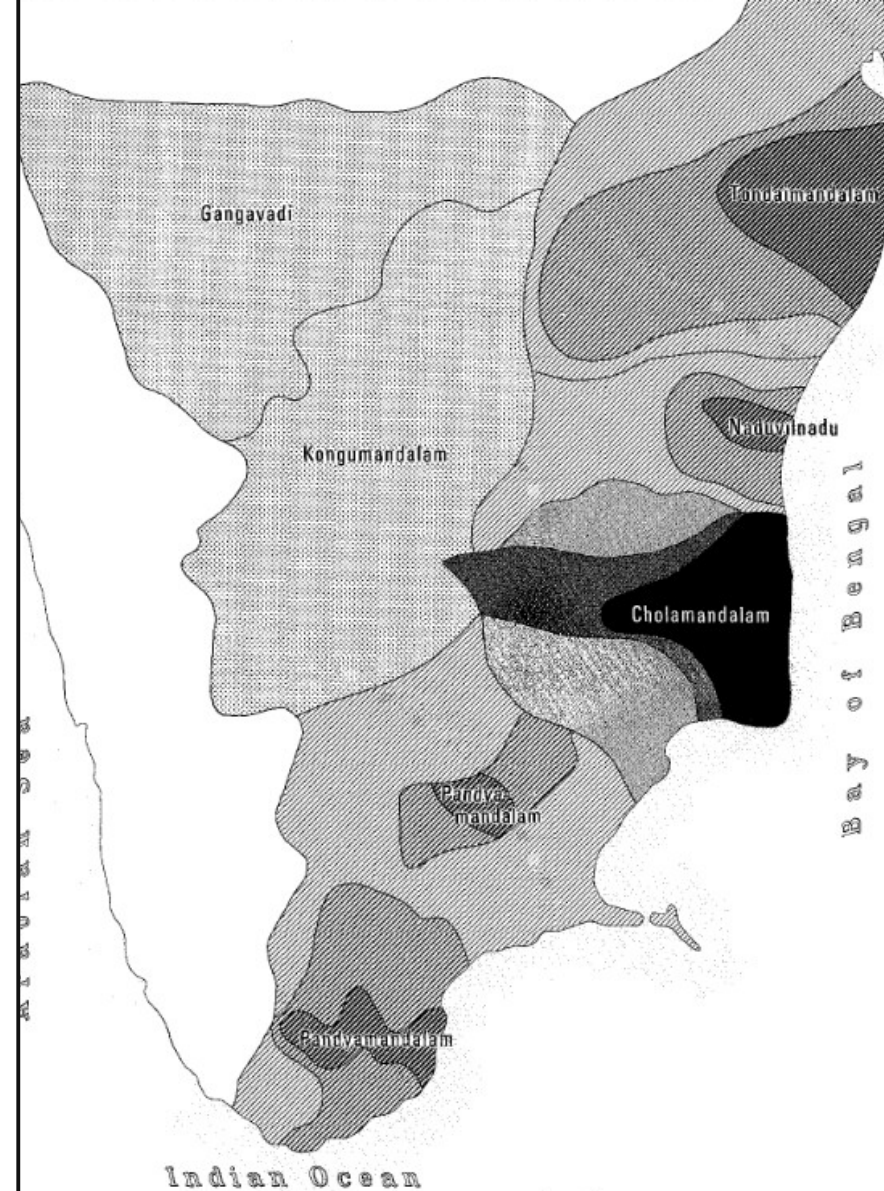


Measuring Rod & Manipulation of value

Establishing Caste Hegemony

Brahmadeyas, or the *agraharas*, were special villages that were created for Brahmins who were brought from elsewhere and these Brahmins were settled in the newly created settlements with rights of cultivation (*karanmai*) and overlordship (*miyatchi*). These villages were called Brahmadeyam or Chaturvethi Mangalam.

The kings or the members of the royal family created such villages by donating huge amounts of land to Brahmins.



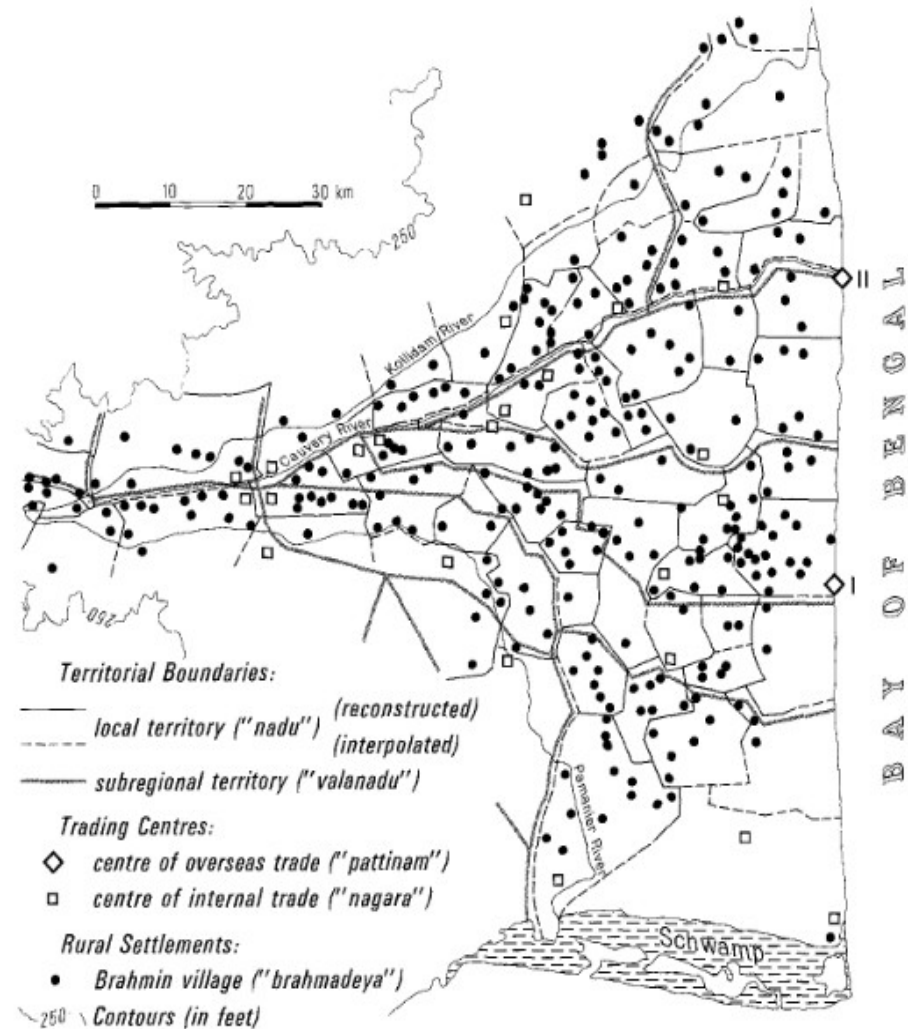
Measuring Rod & Manipulation of value

Aligning Land and Caste

In Brahmadeyas one can observe a distinct feature of straight and parallel irrigation canals with another set of drain canals running at right angle and connecting them in a comb like pattern. These canal networks are almost strictly oriented W-E and N-E, though the natural surface of the delta would not demand such a strict orientation which exhibits a unique artificial character.

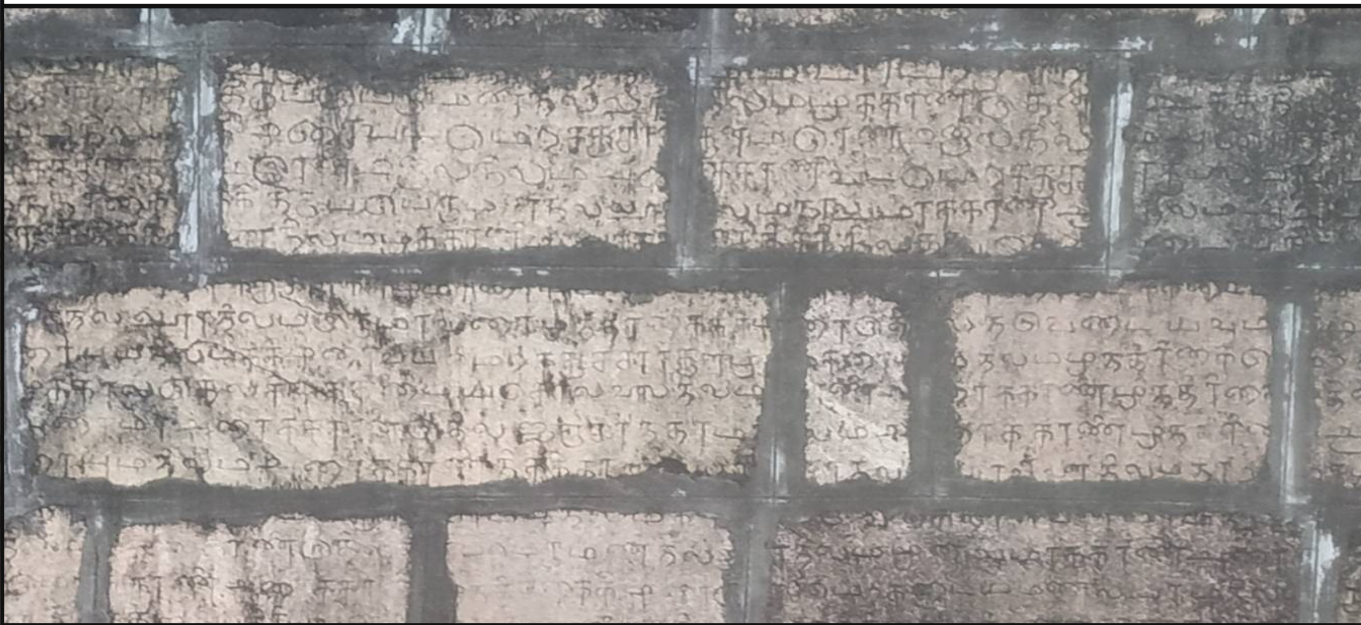
With rights to cultivation assigned to the Brahmins & simultaneously the previous cultivators of other castes becoming tenants to the new landlords, the labour force remained tied to the existing arrangement.

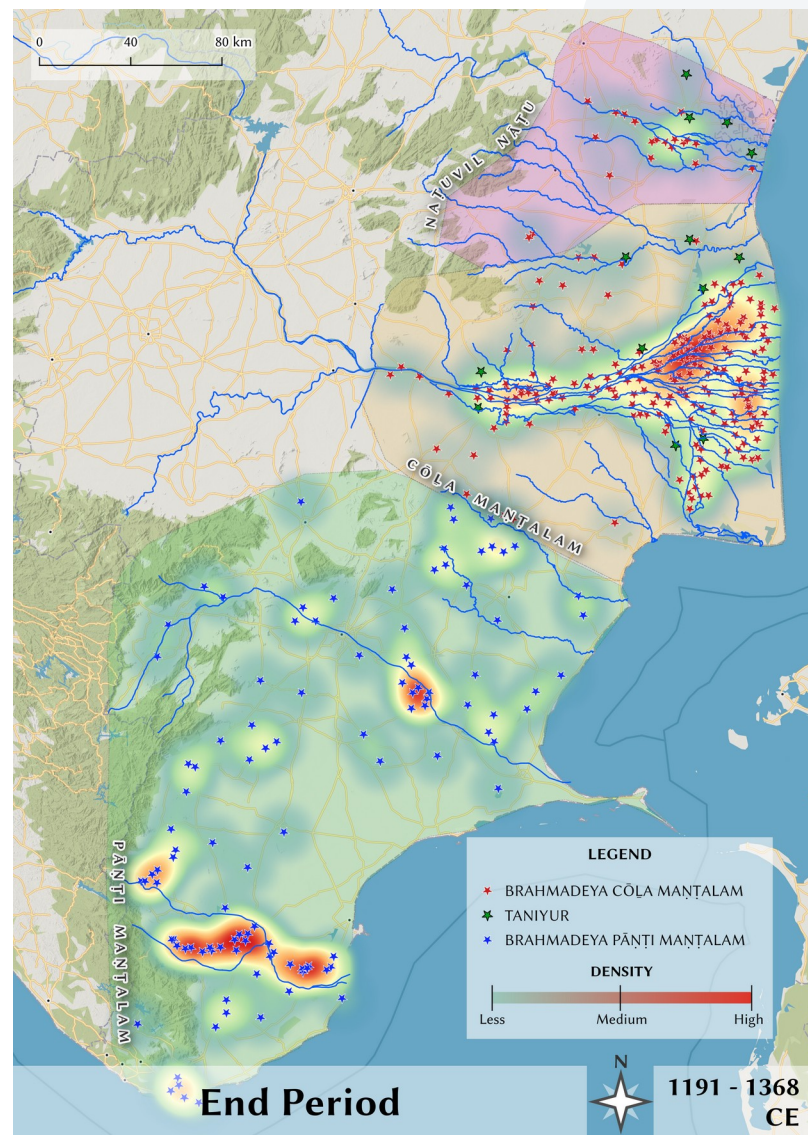
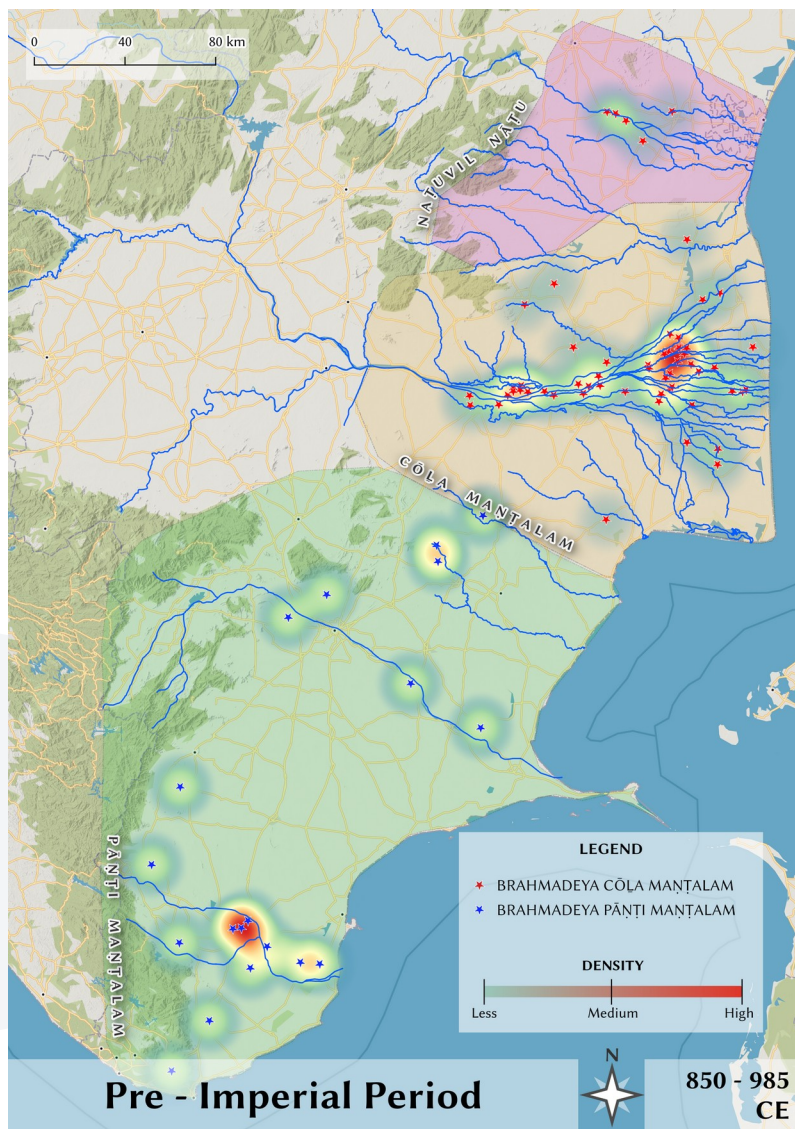
Only the fertile lands were gifted to Brahmins by the kings, and this system was introduced to ensure every Brahmin households get equal amount of land and equal access to water.



Source: Own Draft, after: Hall, 1977; 1978; Stein, 1977; 1980; SUBBARAYALU, 1973

Measuring Rod & Manipulation of value

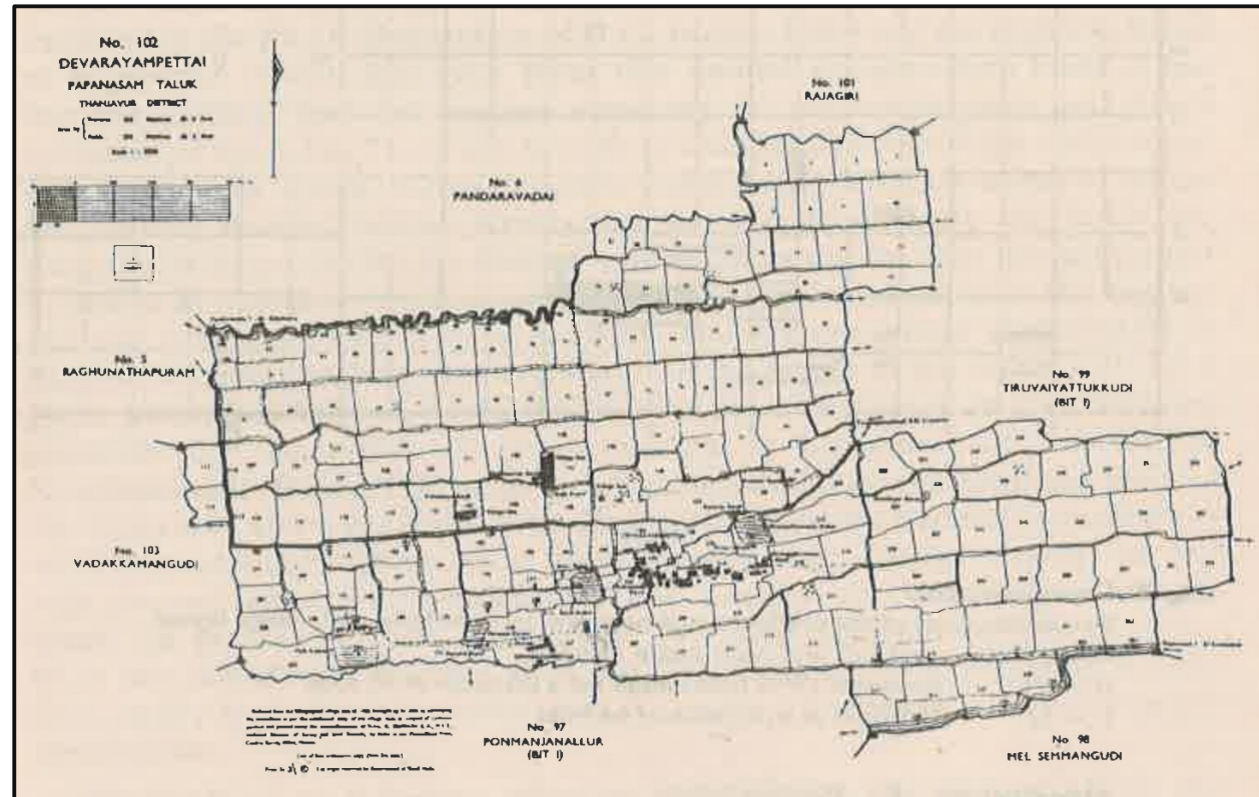




Measuring Rod & Manipulation of value

Square Grid : Engineering the Land

The land was engineered in such a manner, by constructing canals (Vaikkal) and drains (Vathi) to form a square-grid (Kannaru - Sathuram) or checker board structure which made sure the equal distribution of water (and thus fertility of soil), among all land owned by the Brahmins

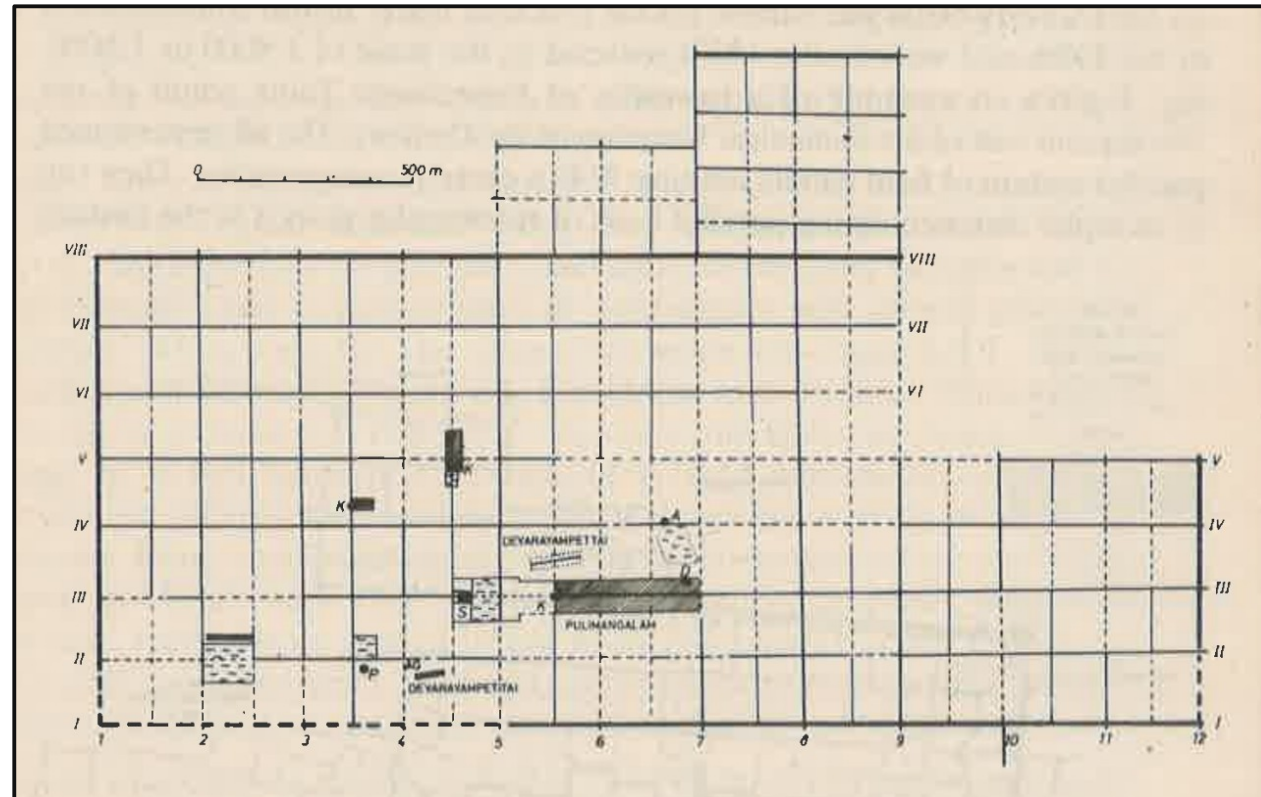


Measuring Rod & Manipulation of value

Square Grid : Mensuration Geometry

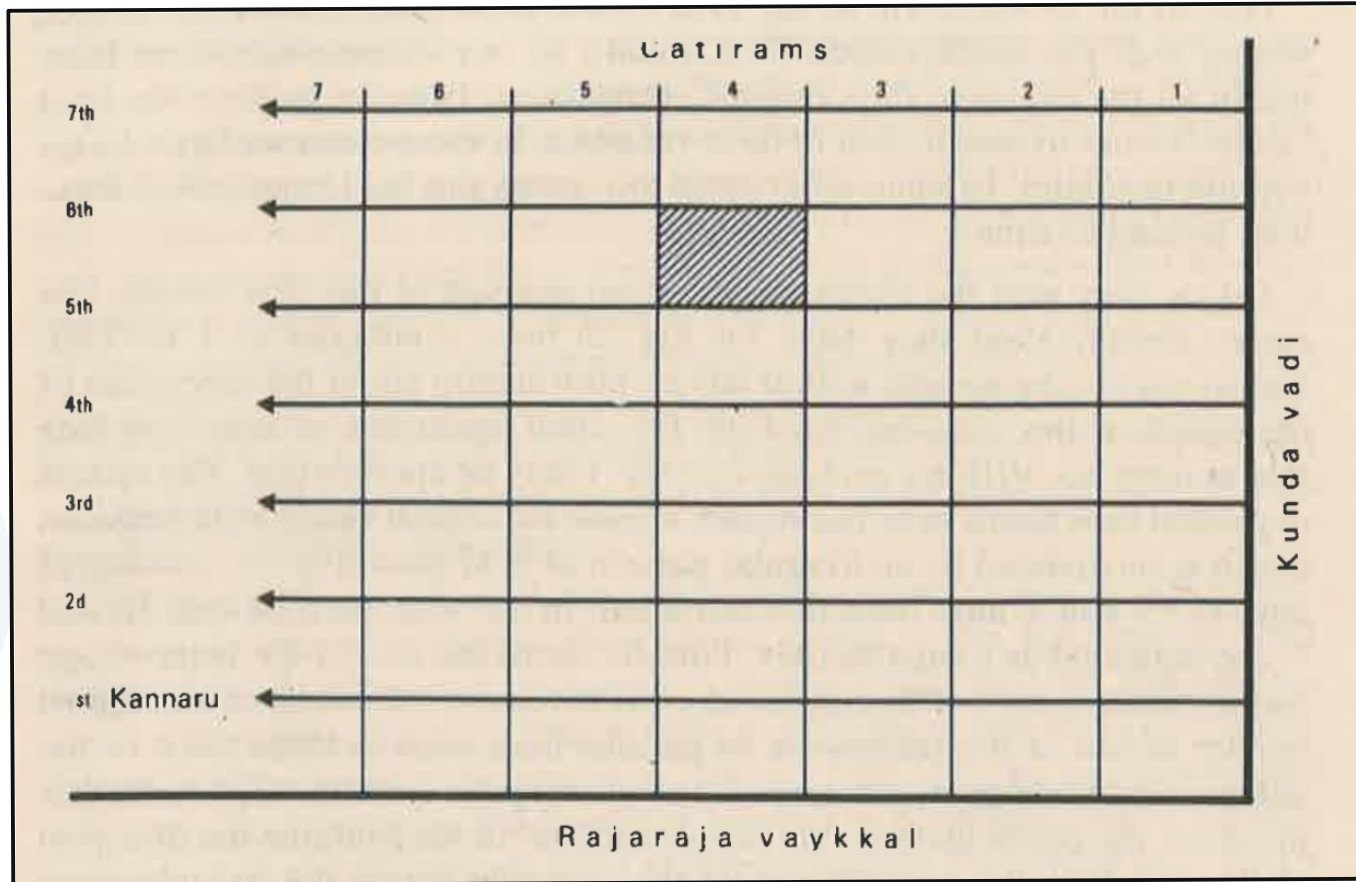
Geometric distribution ensured equal proportion to single caste, establishing caste hegemony.

In the new arrangement extraction of slave labour is legitimized, with Brahmins and Temples as the new land owners.



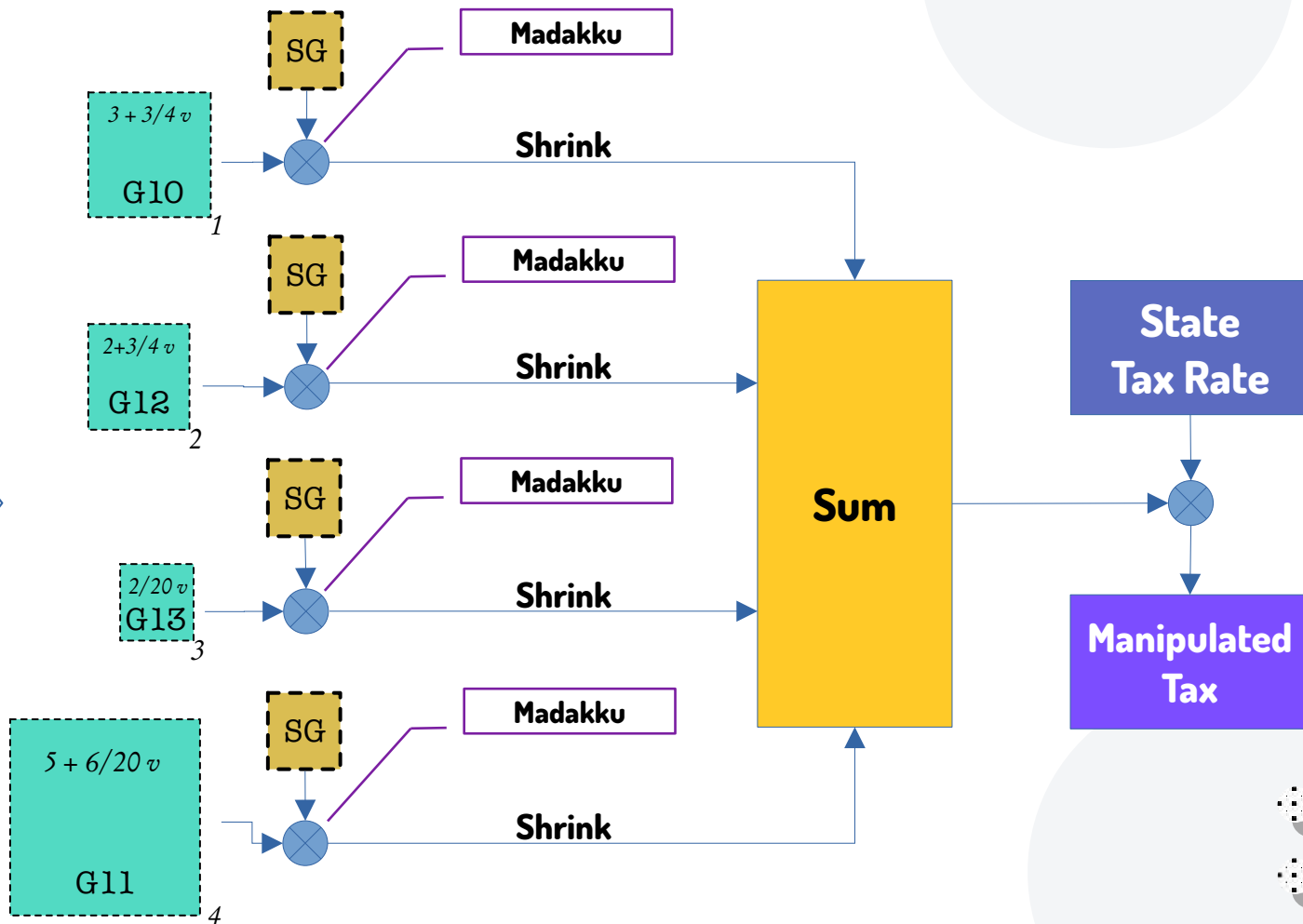
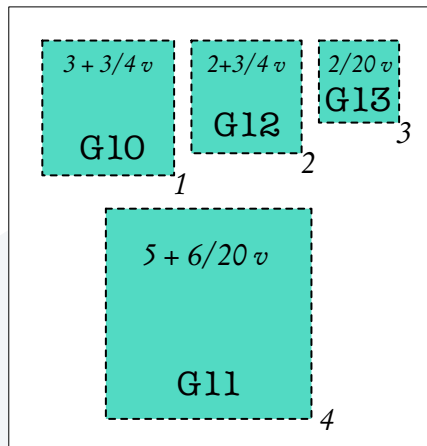
Measuring Rod & Manipulation of value

Kannaru & Vadi (irrigation pattern through square grid)



Madakku System (Folding)

SG



Measuring Rod & Manipulation of value

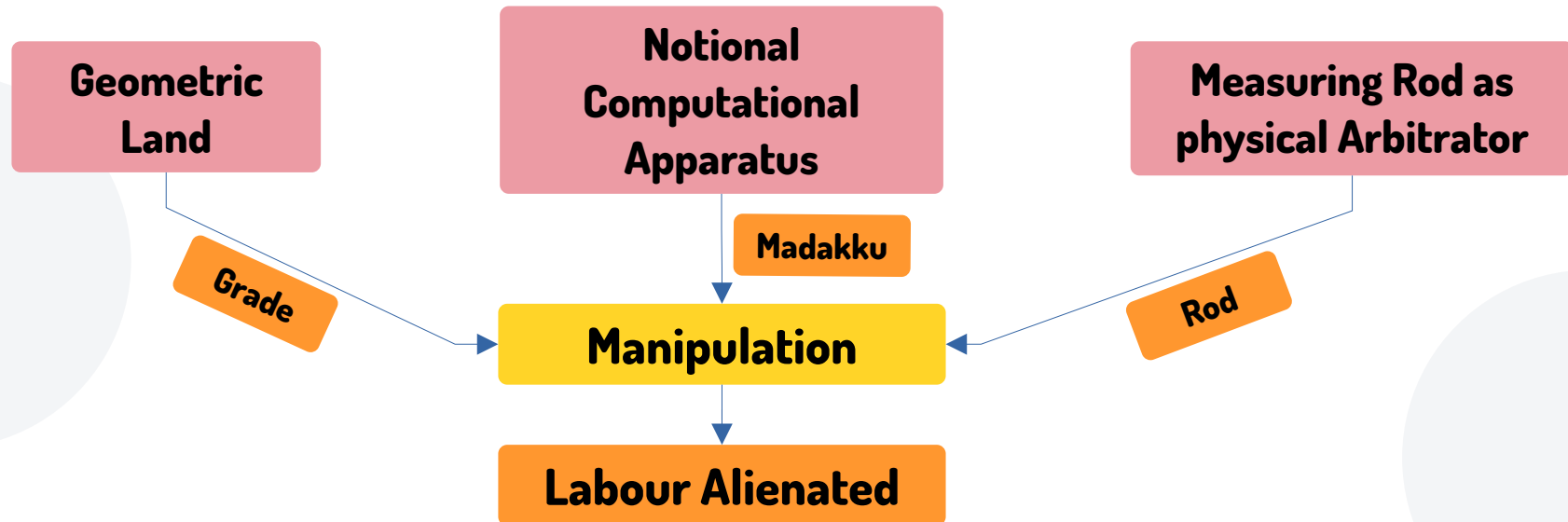


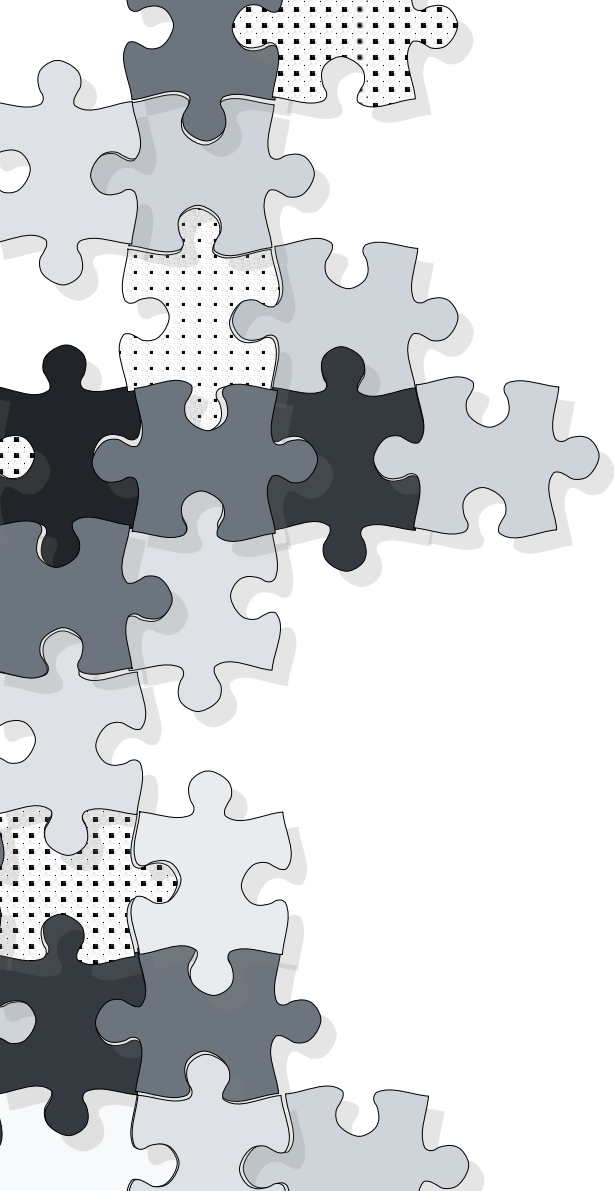
- Will be on the Temple walls, transparent to audit
- To arbitrate disputes
- More than one standard : Local (12ft) and Royal rods (16/24 ft)

Measuring Rod & Manipulation of value

Madakku System & Value Generation

- Value generation happens through a mechanism of commensuration, making a computational apparatus through accounting
- Quantification of Quality : *Folding Quality into Quantity, the Madakku System*
- Possibilities of Manipulation created



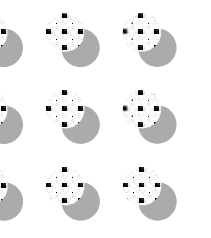


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Pearls, Sieves, & Tables of value

”





Pearls, Sieves, & Tables of value

Pearls

1. Site of Extraction : 16th century - Gulf of Mannar
 2. Migrating oysters in Nature
 3. Labour process of Diving, Hunting are the primary source of Value
 4. Be it the precolonial or the colonial take over, - the merchant trader reaps the value
 5. **Muthukanakku**, 16th century text as records of practice of a mercantile practitioner.
 6. Codification of value generation, which begins after labour – erasing it.
- 

Pearls, Sieves, & Tables of value

Sieves

A geometric device to sort, to grade.

Number of holes, size of the holes in each
angular segment of a circle

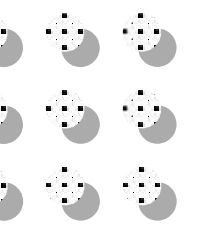


Pearls, Sieves, & Tables of value

Tables

Pearl colander	No. of Holes per axis
20	11
30	13
50	15
80	17
100	21
200	25
400	29
600	33

Pearl colander	No. of Holes
20	91
30	127
50	169
80	217
100	331
200	469
400	631
600	817



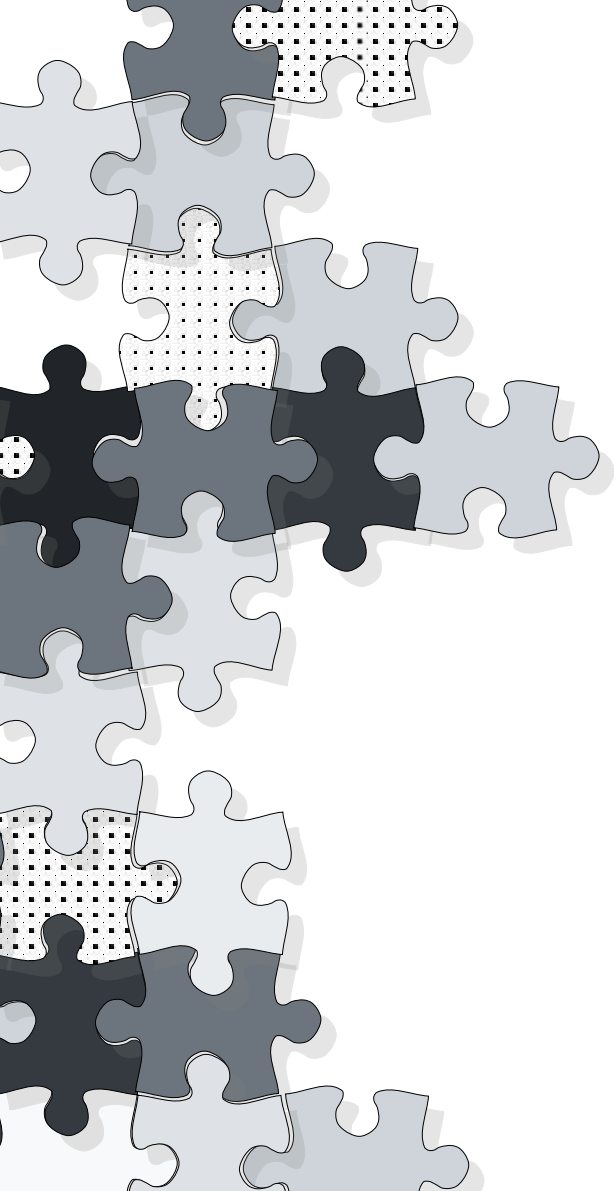
Pearls, Sieves, & Tables of value

Index of measure : Cevvu

1. Valuation continues, through commensuration creating a single index out of three qualities – the **Cevvu**, constituting of :
 1. Size
 2. Luster
 3. Weight
2. Geometric distribution in physical devices lends to arithmetic tabulation of value & then grant it to the market.
3. Once again measurement of value begins after labour, erasing it.

ALIENATION COMPLETE



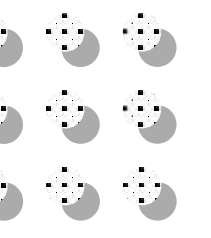


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Measuring Trust & Extraction of value

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Measuring Trust & Extraction of value

Measuring Trust through the eyes of Financial World

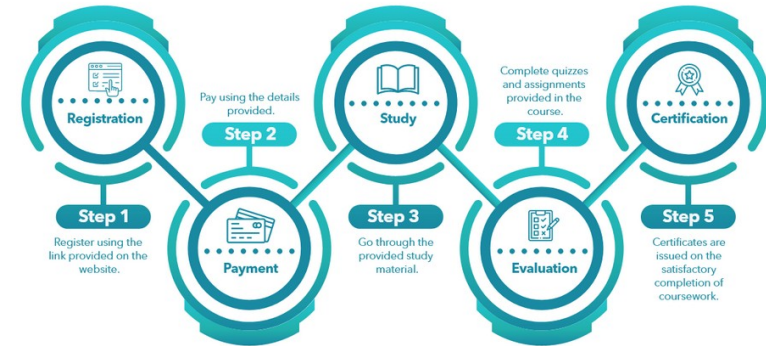
All house hold needs are interpreted and measured in terms of finance benefits, thus abstracting the household needs such as health care, education, food, water, gas, etc... into transferable benefits to the citizen from the state's social welfare scheme through an elaborate means of unique identification, profiling of consumption, expenditure .. – thus establishing a **borrower – creditor relationship between the state and the citizen.**

- Household's need for Debt, becomes Credit demand in the financial market
 - Financialization of public welfare schemes, adds market uncertainty in income & expenses
 - Interest rate modeling, scheduling, are **optimized to maximize repayment** efficiency
 - Financial market competition rises the **recursive loan burden** at the household level for the working women
- 

Working Women, Credit Scores/Ranks, Algorithms, Agents and Certification



How Does It Work?



CRIF Highmark Credit Score

CRIF Highmark
Credit Report



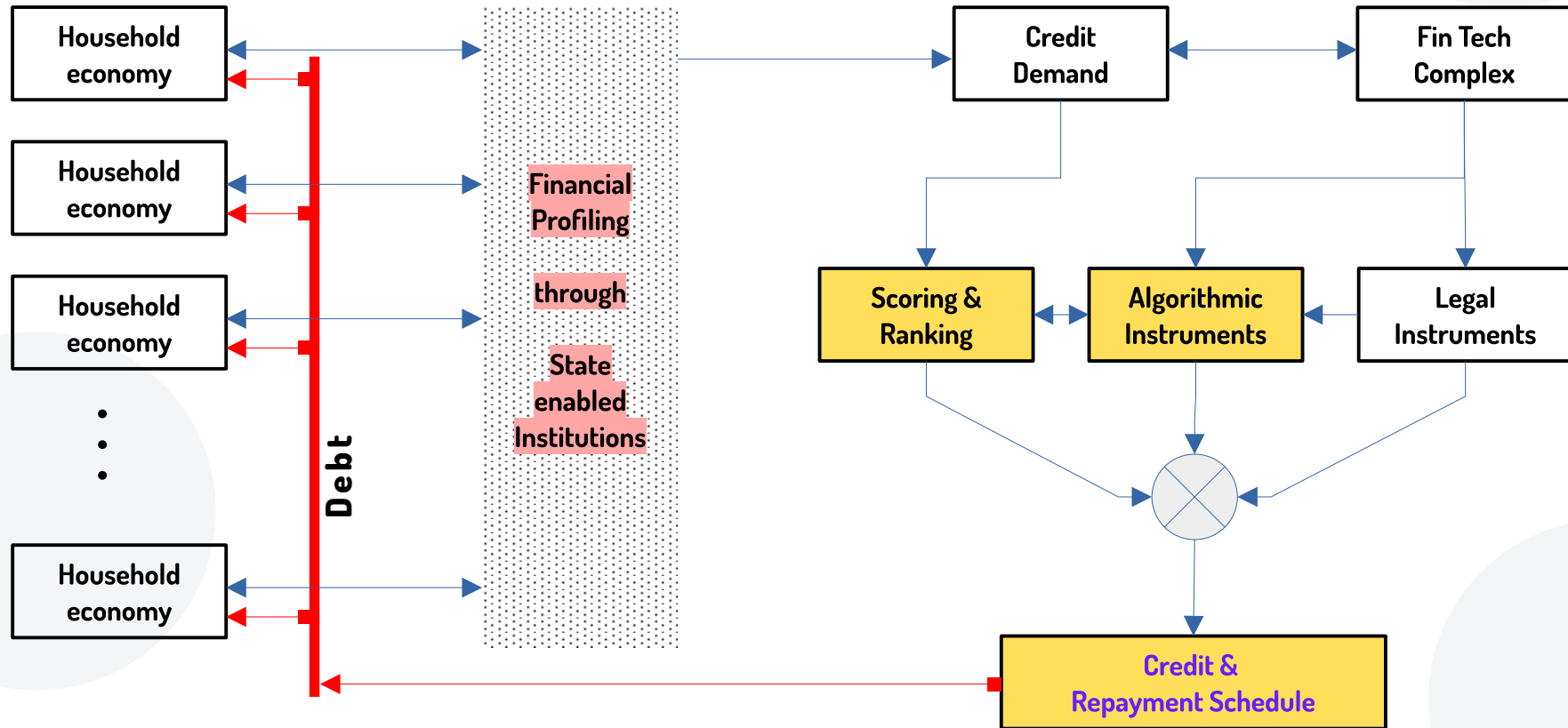
Numeric
Summary →

CRIF Highmark
Credit Score



Measuring Trust & Extraction of value

Computational Infrastructure – Safety net for the Extractors



Creditworthiness & Financial Models

Scoring & Ranking

Scoring/Ranking models take variables like payment history, credit utilization, credit history, type of credit, total balance, recent behavior, available credit, etc... but fixed coefficients (weights) that eventually safeguards the lender's investment in credit business.

Algorithmic Instruments

By using the individualized financial profiling of the individual, that constitutes monitoring of consumption as well as credit history, algorithms facilitate the ranking mechanisms that will aid the creditor to take decisions – which is continuously optimized to reduce the risk taken by the creditor.

The resulting scores, or ranks of the individual will coerce them to either take more credit or ignore their household economy that creates and maintains inequality.

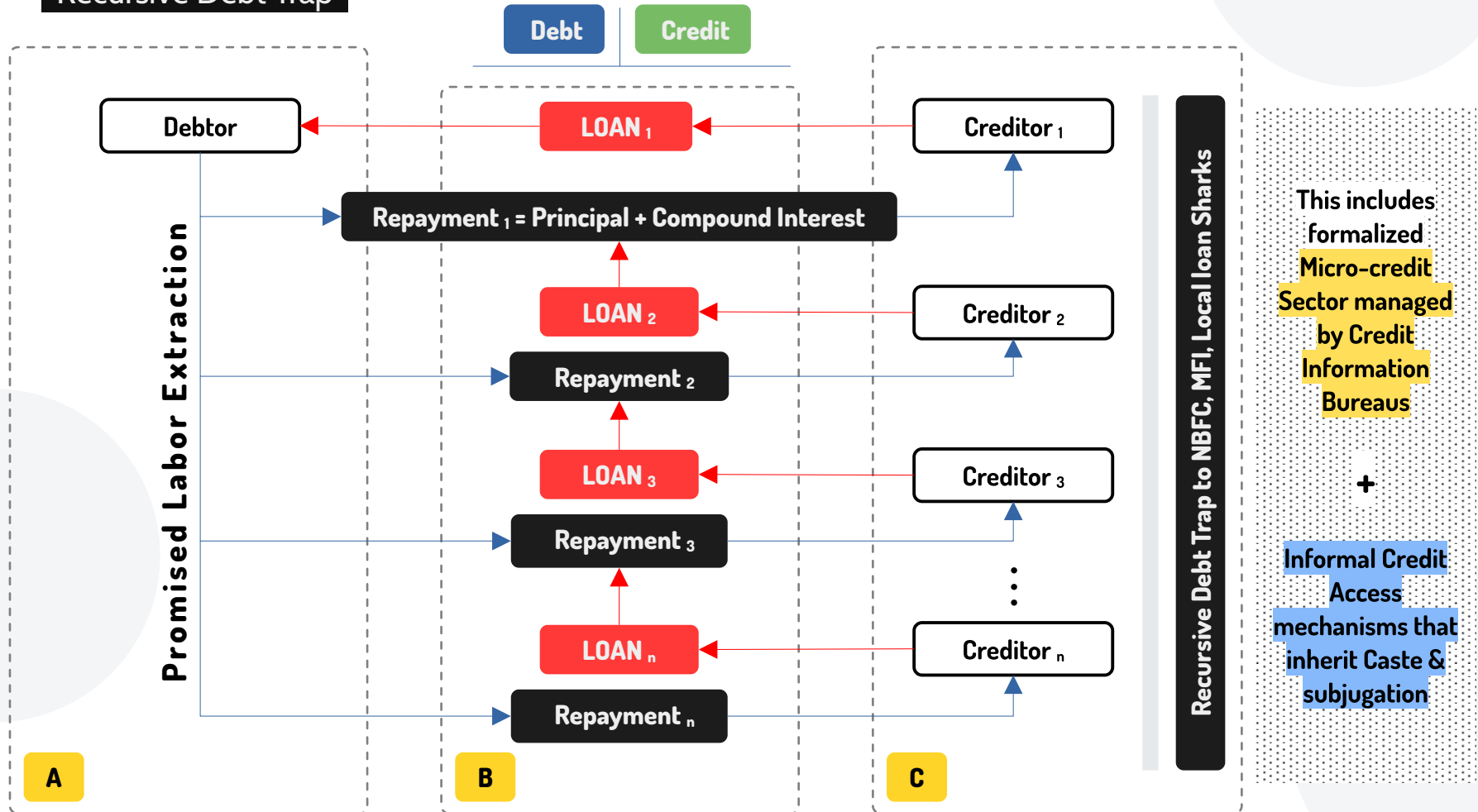
Credit & Repayment Schedule

Based upon the debt credited to the borrower (debtor), the fin-tech algorithms following the mathematical model, provides a repayment schedule that can distribute the installments over the promised period.

Equitable Monthly Installment – distribution model for the compound interest payment.

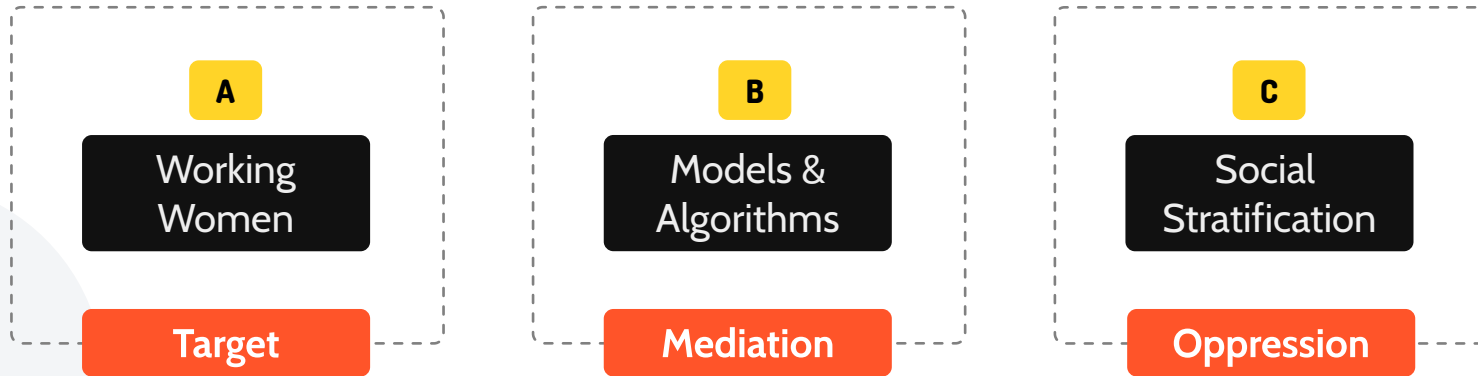
Measuring Trust & Extraction of value

Recursive Debt Trap



Measuring Trust & Extraction of value

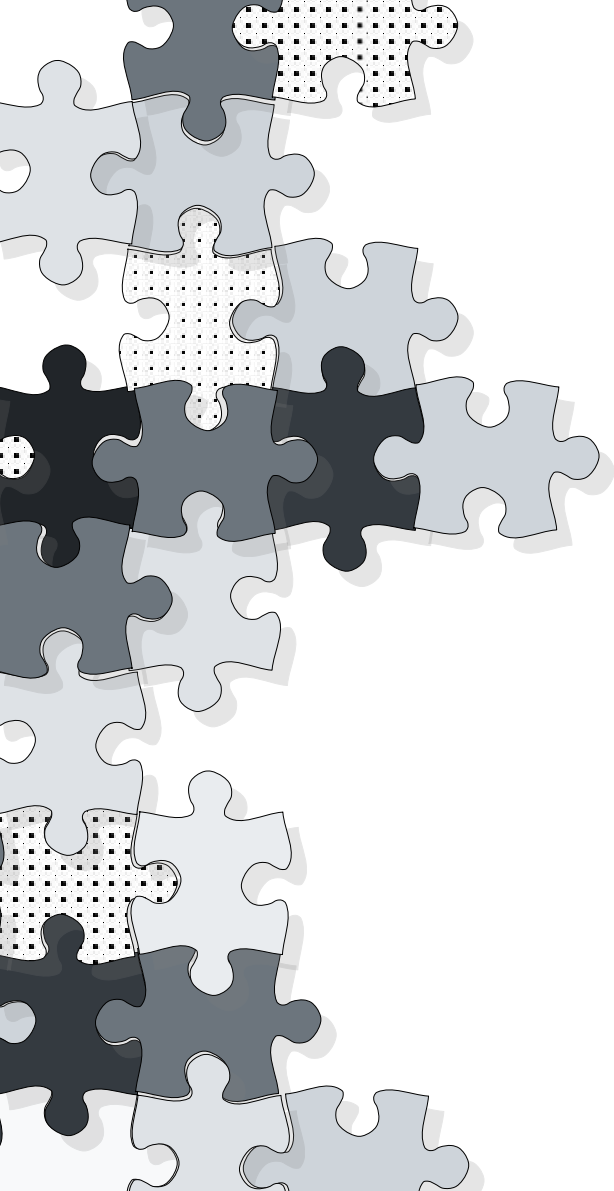
Origins of Trap



Measuring Trust & Extraction of value

Alienation

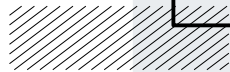
- Algorithmization of Credit scoring & ranking polarizes the reinforcement of Credit supply to debtors (well behaved !) and ignores the women who needs it (especially during pandemic)
- Quantification of Trust alienates women's labour and their household needs – through algorithmization, and financialization.
- Elaborate computational infrastructure integral to alienation of women's labour.
- Large part of debt finances social reproduction rather than investment. **Informal debt** in India represents **70% of household outstanding debt in volume**. [Gregory, 1997; Nair, 2016]



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Conclusion

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Observed Overall common pattern

