Quality Control of Natural Dyestuffs:

The Case of Dutch Madder, 1450-1850

Ernst Homburg
25 October 2022
Department of History, Maastricht

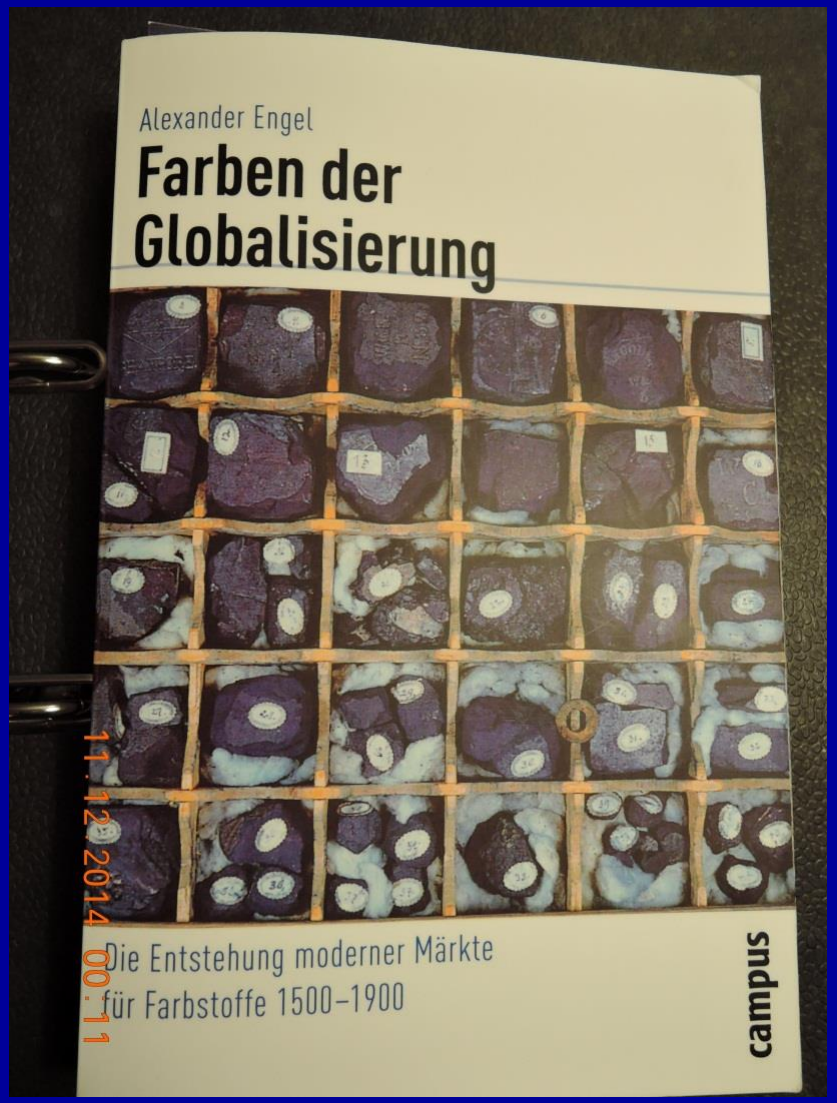
Two important books on natural dyestuffs

- Augustí Nieto-Galan, *Colouring Textiles. A History of Natural Dyestuffs in Industrial Europe* (2001).
- Alexander Engel, *Farben der Globalisierung. Die Entstehung moderner Märkte für Farbstoffe, 1500-1900* (2009)

But

- Nieto-Galan on scientific tests, but not on day-to-day practices
- Engel very good reflection on implications of changes in quality control, but no details on tests used in practice

So: unexplored territory



Madder and indigo: the two most important dyestuffs for centuries (until ca. 1875 resp. 1910)

- **Indigo**
- plant
- dye
- colour

- **Madder** (Dutch: meekrap; French: garance)
- plant (German: Färberröte)
- dye (German: Krapp)
- mordant dye: yellow-orange, brown, purple, red (dependent on mordant and dye recipe). Famous for red.

The long road to the Netherlands

- Iran/ Persia – Turkey – Caspian Sea (Antiquity) – or even older ??
- Europe: monasteries ca. y 1000 > Flanders
- Cloth dyeing in Ghent and Bruges – Middle Ages (cloths = woollens)
- 1365-1375 the earliest madder regulations: Middelburg – Ghent – Reimerswaal
- *1350-1880 flourishing madder cultivation and trade in Zealand, Western-Brabant and South-Holland*

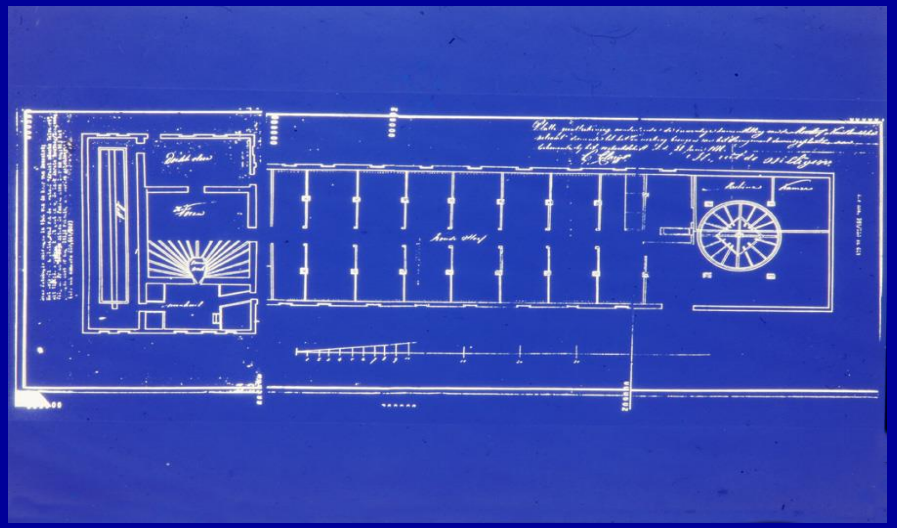
Outline: The Case of Dutch Madder
Work in progess (!)

- (1) Dutch madder production
- (2) Official quality control by government inspectors
- (3) Quality control by traders
- (4) Quality control by dyers and printers
- (5) Chemical tests
- (6) Implications for understanding pre-modern dyestuffs markets

(1) Dutch madder production

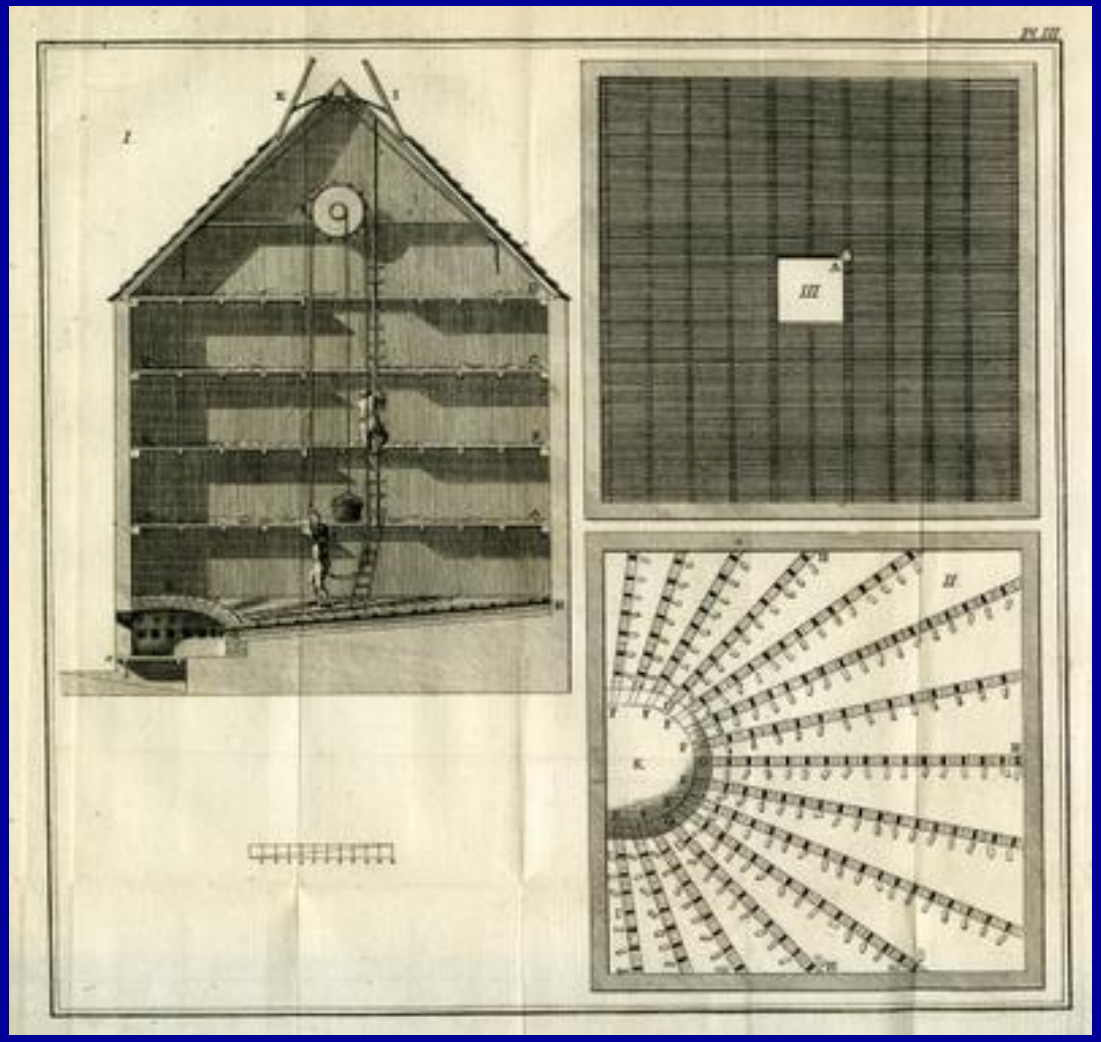
- Agriculture – drying and pulverising in small factories, owned by a community of farmers. Ca. 10 workers, in autumn.
- Local traders + global trade via Rotterdam (and Amsterdam)
- By 1850-1870: Ca. 130 madder factories, called madder stew (meestoof)

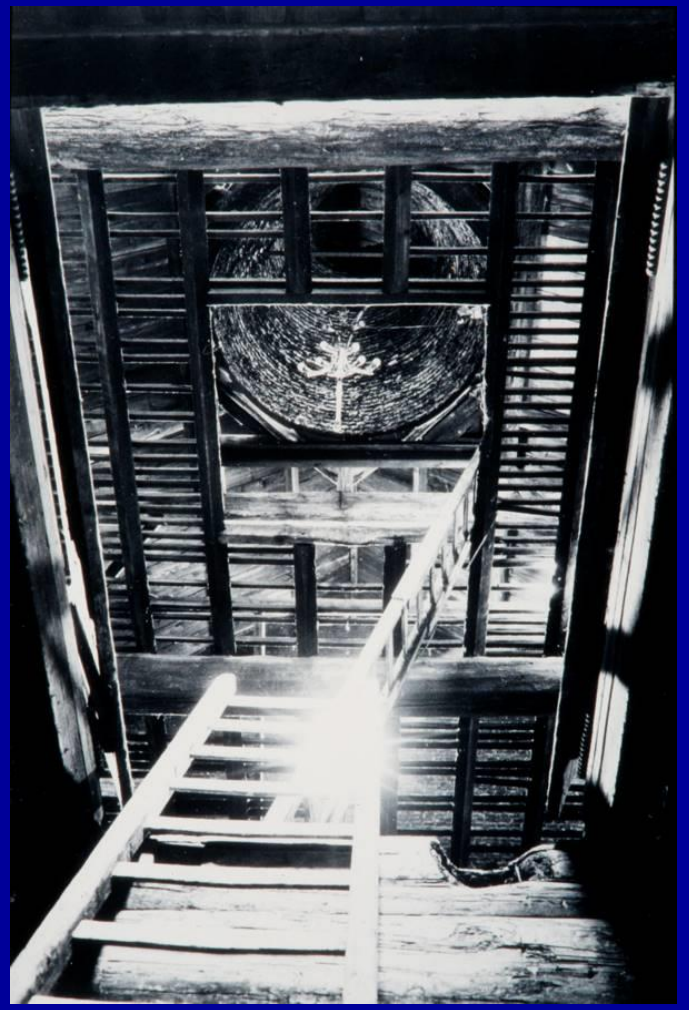
- Stoof/ stew = because heat was applied .
- Mee = meekrap



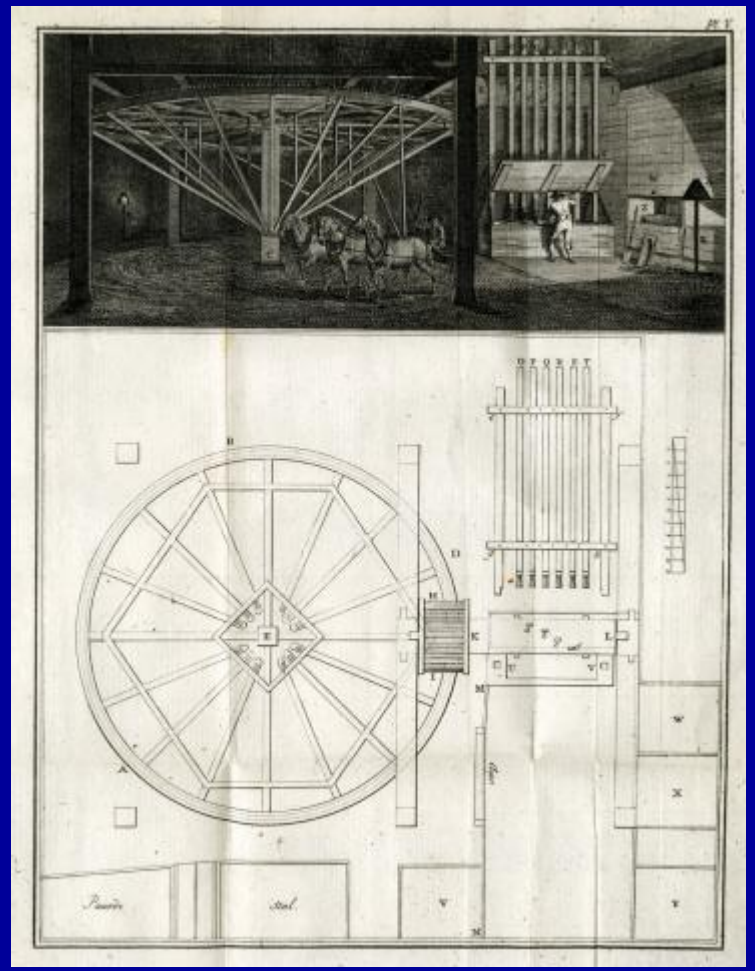
- Cold stew (koude stoof) = storage (segments for farmers)
- Tower/ hot stew = first drying
- Kiln = second drying
- Mill = pulverisation (by pounding)

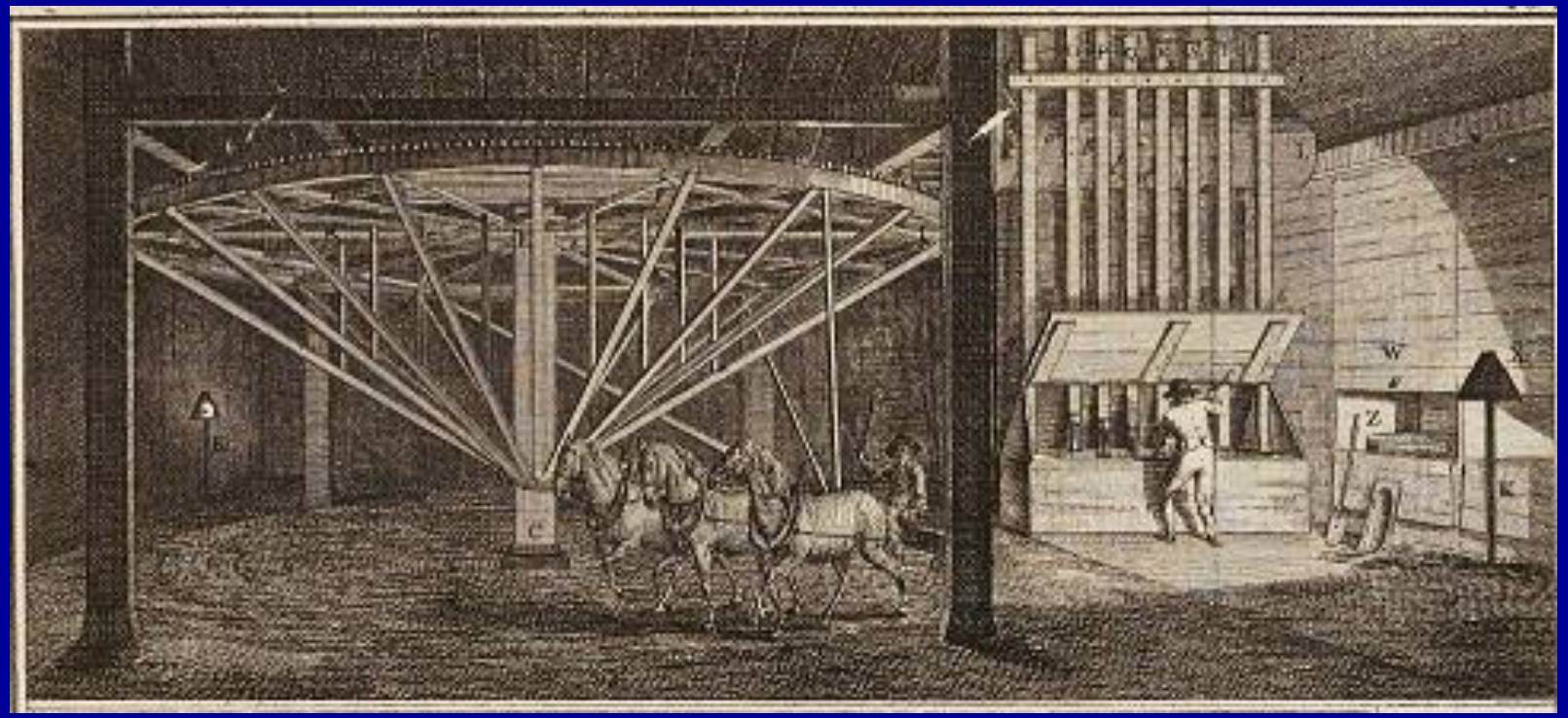
The tower: 1st drying + threshing and sifting > racine



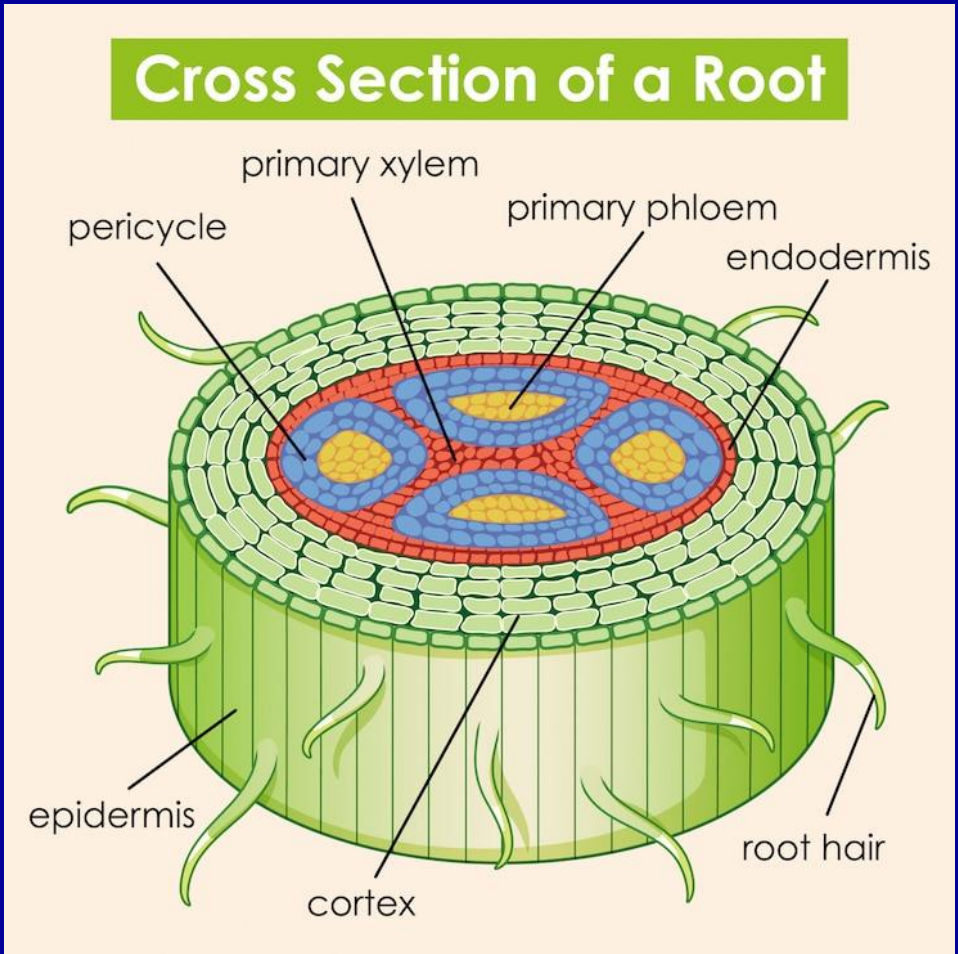


The (horse) mill: pounding / stamping of the dried root for different trade varieties





Trade varieties of madder



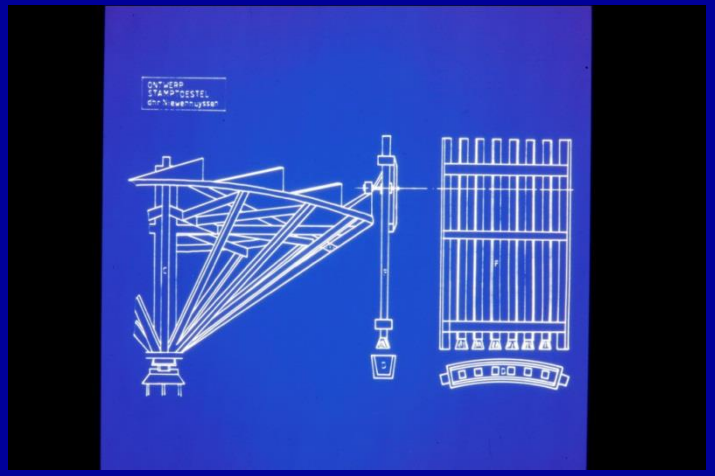
Root = core, cortex and skin

- K = ‘krap’ or fine madder (core)
- G = gemeene (common) (cortex)
- O = onberoofde (unstripped) (core and cortex pounded together)
- M = mul (skin + wastes)

Order >> M + O/ G + K

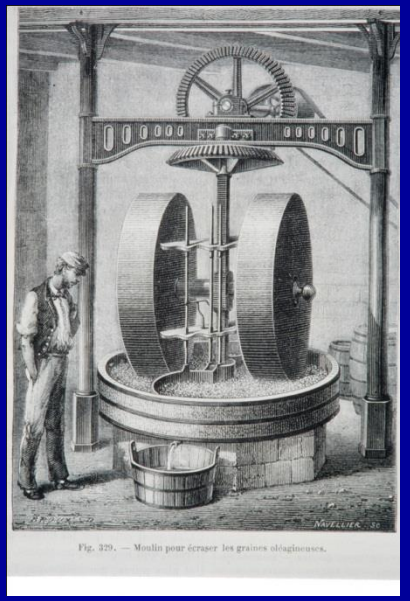
Dutch vs. French madder

- Dutch: broken by stampers, separation of outer skin or bark, middle part (cortex), and core (‘heart’) of the root
- French: grounding of entire root : only degrees of fineness: F, SF, SSF etc.



Four different qualities

- *Mul* (sandy powder of the bark) (1st trashing + sifting)
- *Gemene* (ordinary; 2nd pounding and sifting)
- *Krap* (3rd pounding)
- *Onberoofde* (unfleshed; Krap and Gemene together) (K/G ½ and 2/1)



(2) Official quality control by government inspectors

- Government regulations + official inspectors since at least the 14th C.
- Details known from surviving ordnances, formal decisions and laws of:
- the towns of Bergen op Zoom, Zierikzee, Reimerswaal, and Goes (1441-1622) (1662)
- Province of Zealand (1662-1735) (1806)
- Dutch state (1806-1837) (1845)

Painting 1764 called “The inspection of madder” or “The madder inspectors” – sparked my research >> formal inspection OR testing for the trade? >> investigation of 9 collections – still in progress (see paper)

What was the trade trajectory and how was the quality guaranteed/ controlled? Government – traders – consumers (painting 1627)

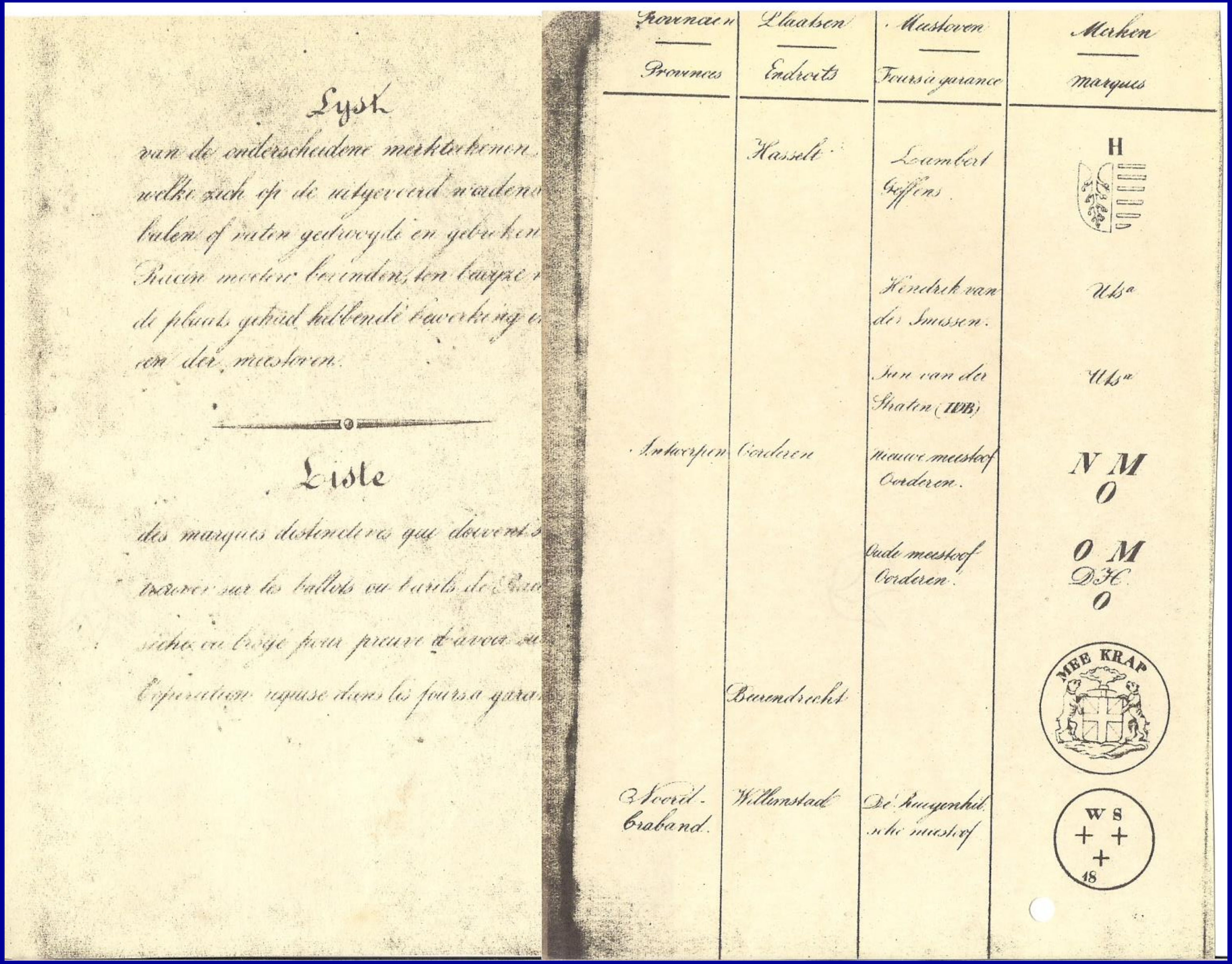
Governmental regulation – quality criteria.
Testing for soil content and certifying bags and barrels

- Krap <2% soil (clay/ sand)
- Gemeene < 8% soil (later 12%)
- Onberoofde < 4-6% soil (later 8%)
- Mul <16% soil

Tools: sampling hand drill; iron for marking (water bowl; spoon)

Sampling, testing for soil content and uniformity of packaging, kind of product, and burning a mark

Local marks



Lyst

van de onderscheidene merkteekenen welke zich op de uitgevoerd wordende balen of vaten gedrooyde en gebroken Rapen moeten bevinden, ten bewyze van de plaats gehad hebbende bewerking in een der meestoven.

Liste

des marques distinctives qui doivent se trouver sur les ballots ou barils de Garance sèche ou broyée pour preuve d'avoir subi l'opération requise dans les fours à garance

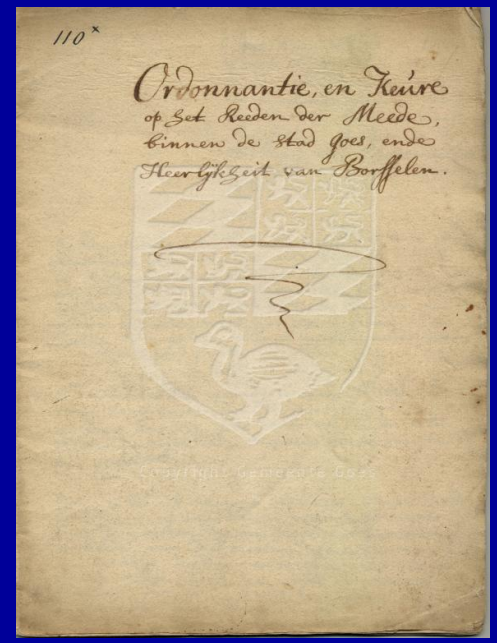
Provincien / Provinces	Plaatsen / Endroits	Meestoven / Fours à garance	Merken / marques
	Hasselt	Lambert Goffens	H
		Hendrik van der Smissen	Ulsa
		Jan van der Straten (IVB)	Ulsa
Antwerpen	Oorderen	nieuwe meestoof Oorderen	N M O
		Oude meestoof Oorderen	O M DH O
	Berendrecht		MEE KRAP
Noord-Braband	Willemstad	De Reugenhil'sche meestoof	W S + + + 18

Wet van 1806 – Bataafsche Republiek

* Keurmeester mag boren waar het hem goeddunkt. Hij controleert de tekens op het vat + plaatst na keuring het wapen van de stad/ het dorp.

* Het aantal merken werd uitgebreid tot zes:
- wapen van Stad of Dorp waar mede bereid is.
- naam van de stoof.
- teken van de reder.
- jaar van het begin der teelt of delving.
- letters of tekens van de verschillende meesoorten (K, G, O, M etc.)
- tarragewicht van het vat.

How was the product tested by government inspectors?
(e.g.: Ordonnantie, en keure op her reeden der meede binnen de stad Goes …, 1622)


110*

Ordonnantie, en Keure
op Set Reeden der Meede,
binnen de stad Goes, ende
Heerlykheit van Borssele.

Visual:

- Is the packing uniform?
- Is the product indeed K, G, O or M?
- Are there adulterations?

Testing for soil content (no details knows before 1806)

- Mouth test
- Water test
- Fire test, for ochre, etc. (1806)

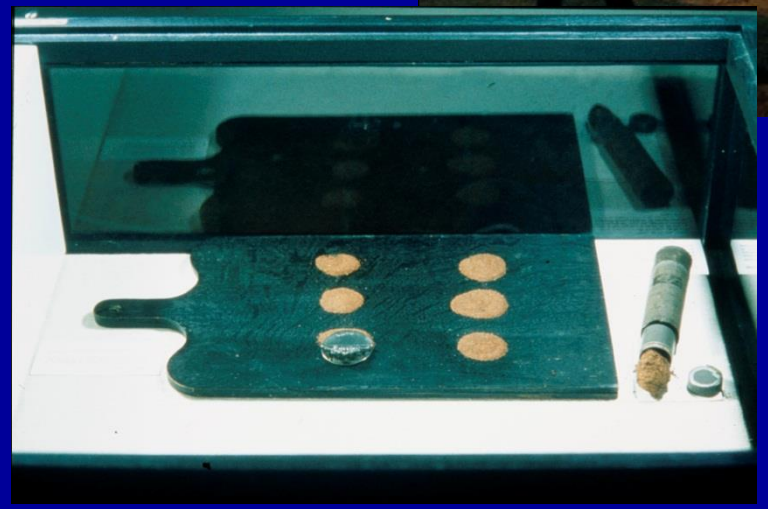
(3) Quality control by traders.
(the madder exchange or fair in Rotterdam, 1737)

Inspection by traders: no rules or regulations, but specialized tools and equipment

- Criterion: not soil content, but colour intensity and stability

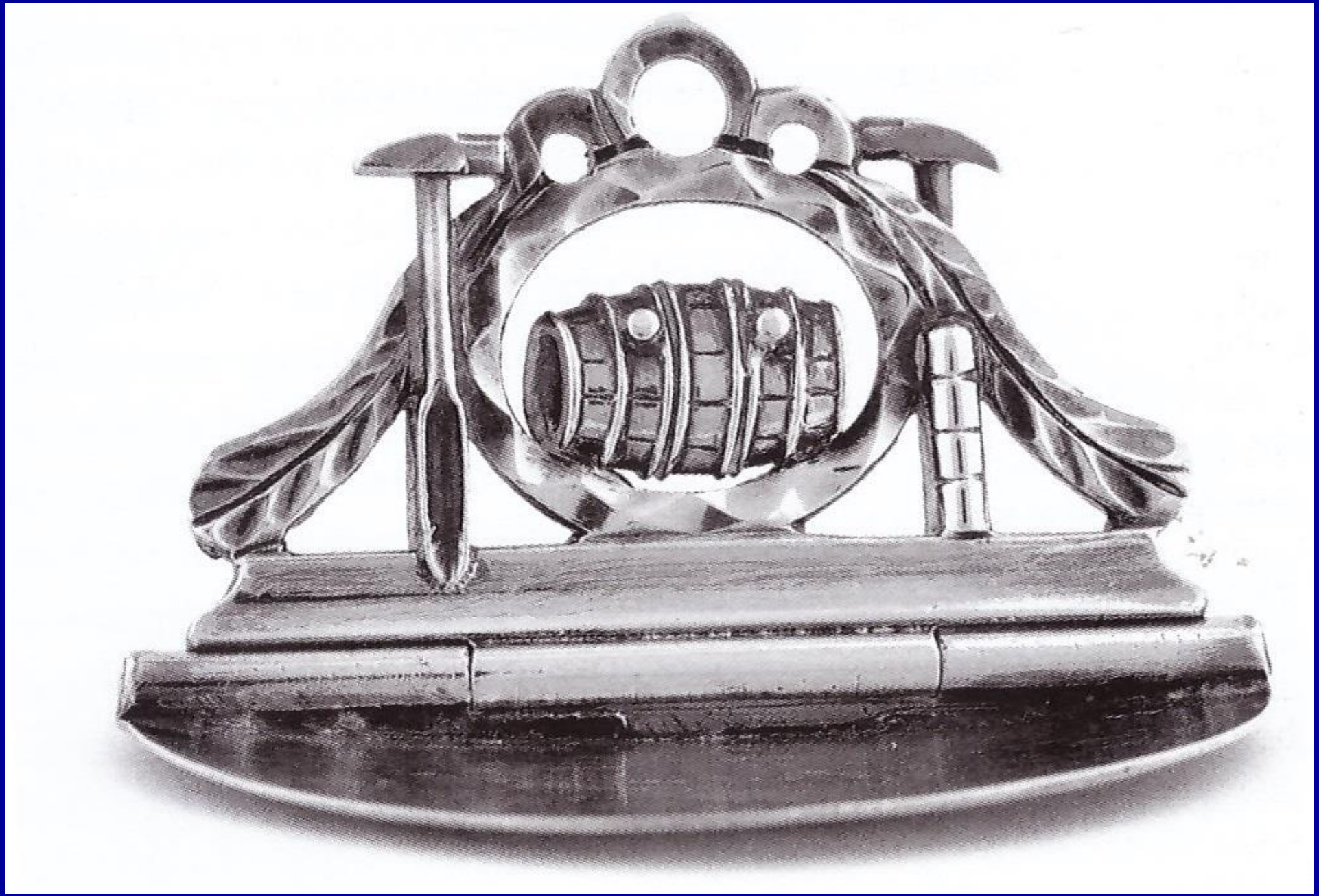
Tools:

- (Hand drill)
- Sample boxes
- Wooden boards
- Chests for boards
- Silver madder touches



Segmented sample boxes or canisters

Chest with boards



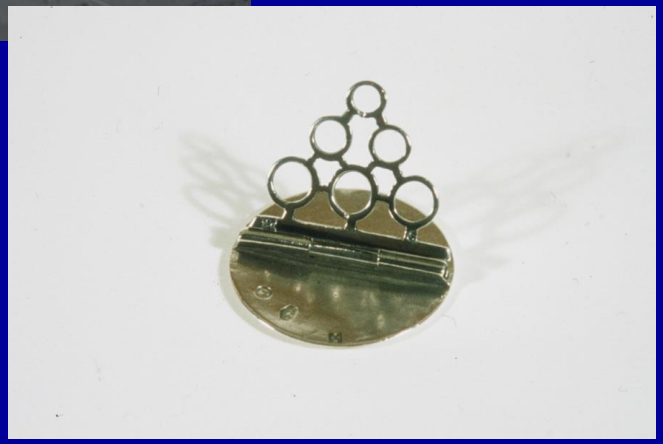
5 cm. Θ

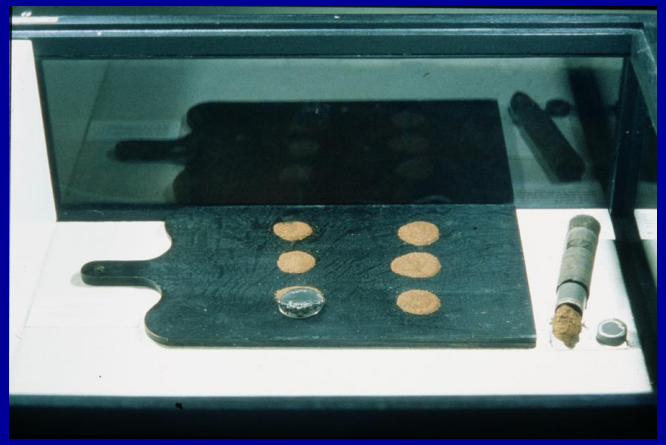
Madder presser or touch

- Silver, ca. 4,5 cm in diameter
- Pressing a madder sample on the test board

Trade examination

- Visual inspection
- Also soil etc.
- Exposure to light, short and long (1 day) (colour should become brighter after exposure to light + test on adulteration)
- Different exposure criteria for dyers and calico printers





(Photo)chemical research needed! - very little research done on chemical reactions in natural dyestuff matrices

- The madder producers: knowledge from experience/ learning by doing !

- (1) The pounding took place at night ! (women,
- Colour change by exposure to light (“belopen van de kleur”)
- Cold nights (October/ November) also had good effect

- (2) Storage + role of humidity
- Colour improved during 2-3 years storage in barrels (went down later)

- (3) The testing by merchants (controversies)
- Visual inspection of particles, taste (sweet), and colour
- Exposure to light, immediate effect & after one day (“belopen van de kleur”)

From cinnamon / yellow / saffron / mustard-yellow > > red-brown / red/ chestnut-brown (OK)

Bad samples: From red >> dark-red or black (OR good: keep the red colour ???)

(4) Quality control by dyers and textile printers

- Conclusion so far: striking differences between official inspection and trade testing
- Dyers and printers again different: use test swatches; dyeing small samples

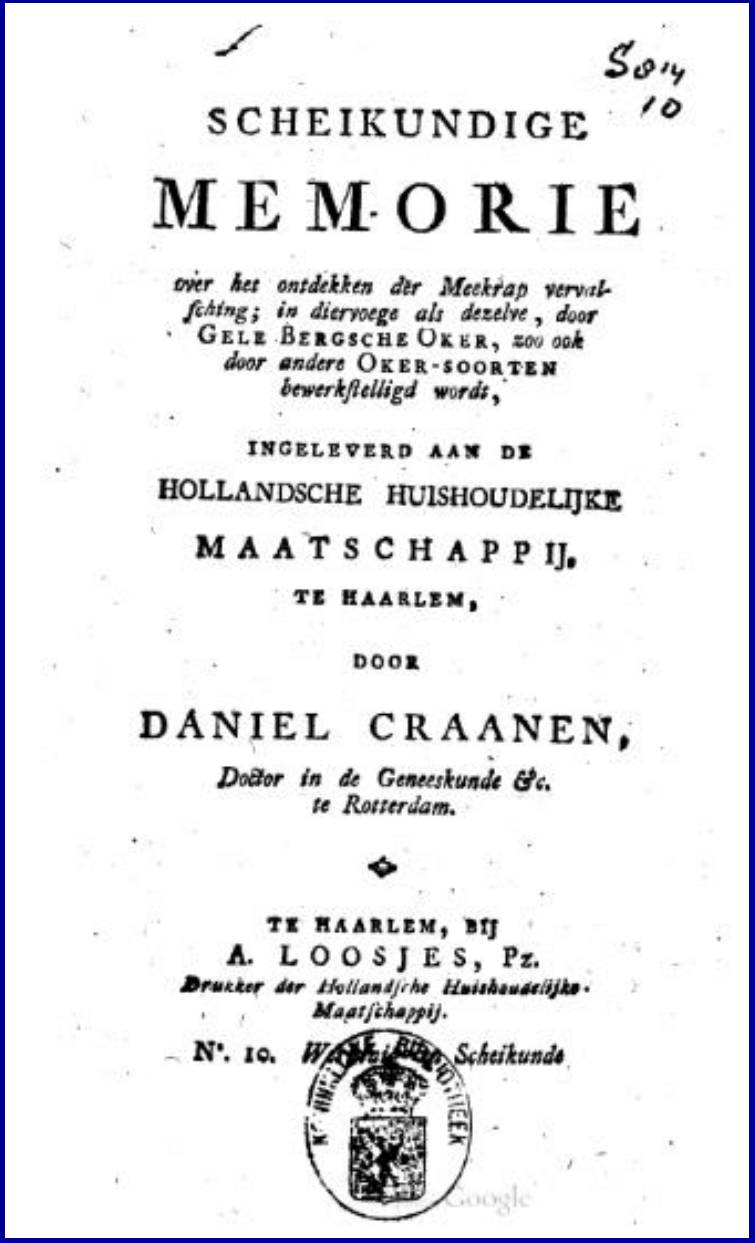
Different types of swatches:

- Dyeing test for adjusting recipes (labs calico printwork c1800)
- Swatches of final products (c1750)
- Swatches as part of procurement of dyes (?? My oldest examples c1850 – but probably much older)

(5) Chemical tests

- 1806 start scientific debate on adulteration
- 1808 Med. Dr. and chemist Daniel Craanen: potassium ferro cyanate
- 1822 again prize contest Dutch Society of Arts
- 1822 pharmacist and chemist Martinus Beets: areometric test
- 1823 report Madder Commission Royal Dutch Academy of Science: Craanen best, but ***too complicated for local official inspectors***. Fire test with HNO3
- 1833: A.H. van der Boon Mesch

>> no changes in practice



SCHEIKUNDIGE

MEMORIE

over het ontdekken der Meekrap vervalschting; in dierwoege als dezelve, door GELE BERGSCHE OKER, zoo ook door andere OKER-SOORTEN bewerkstelligd wordt,

INGELEVERD AAN DE

HOLLANDSCHE HUISHOUDELIJKE

MAATSCHAPPIJ,

TE HAARLEM,

DOOR

DANIEL CRAANEN,

Doctor in de Geneeskunde &c. te Rotterdam.

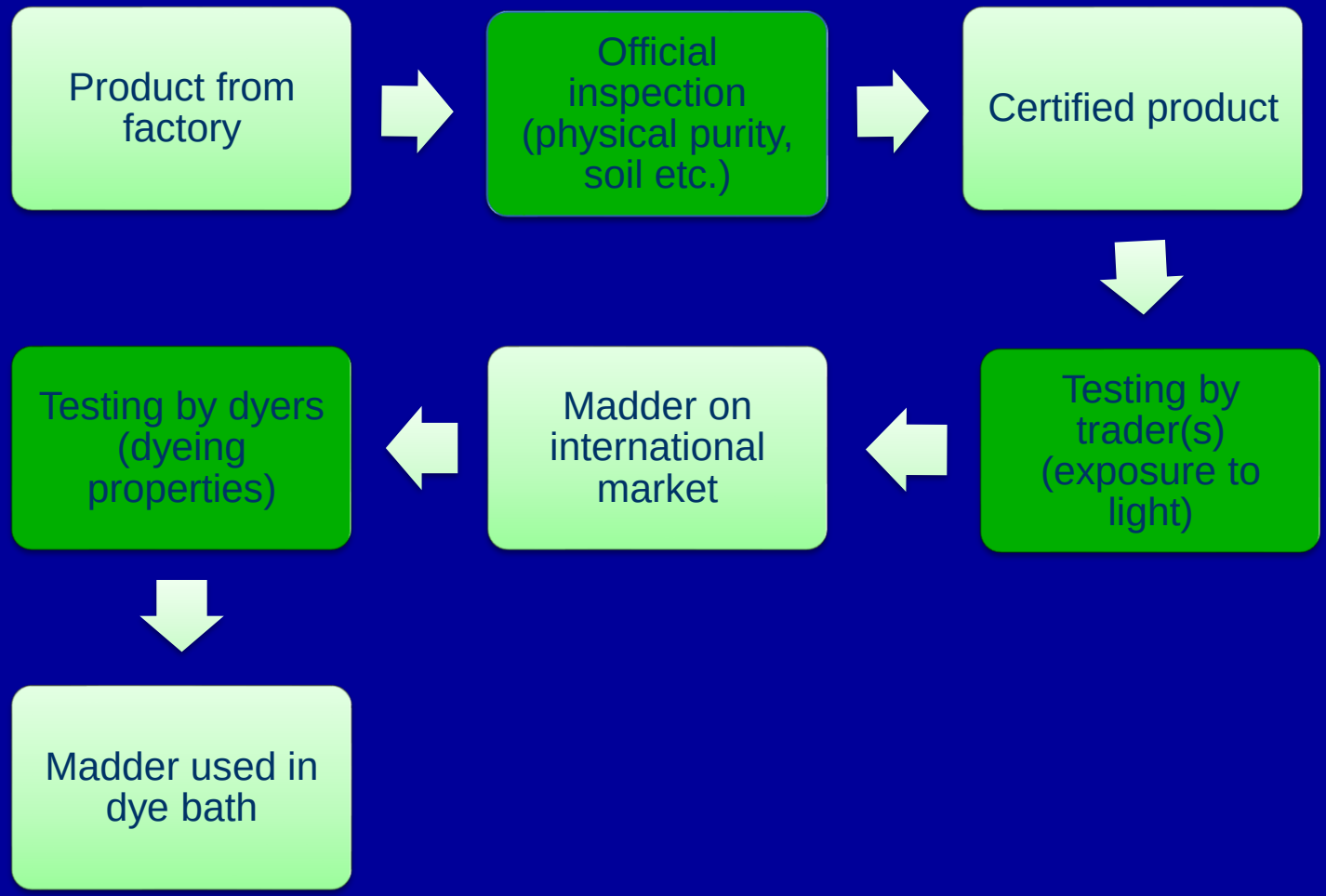
TE HAARLEM, BIJ

A. LOOSJES, Pz.

Drukker der Hollandsche Huishoudelijke Maatschappij.

N°. 10. *Scheikunde*

(6) The pre-modern dyestuffs market

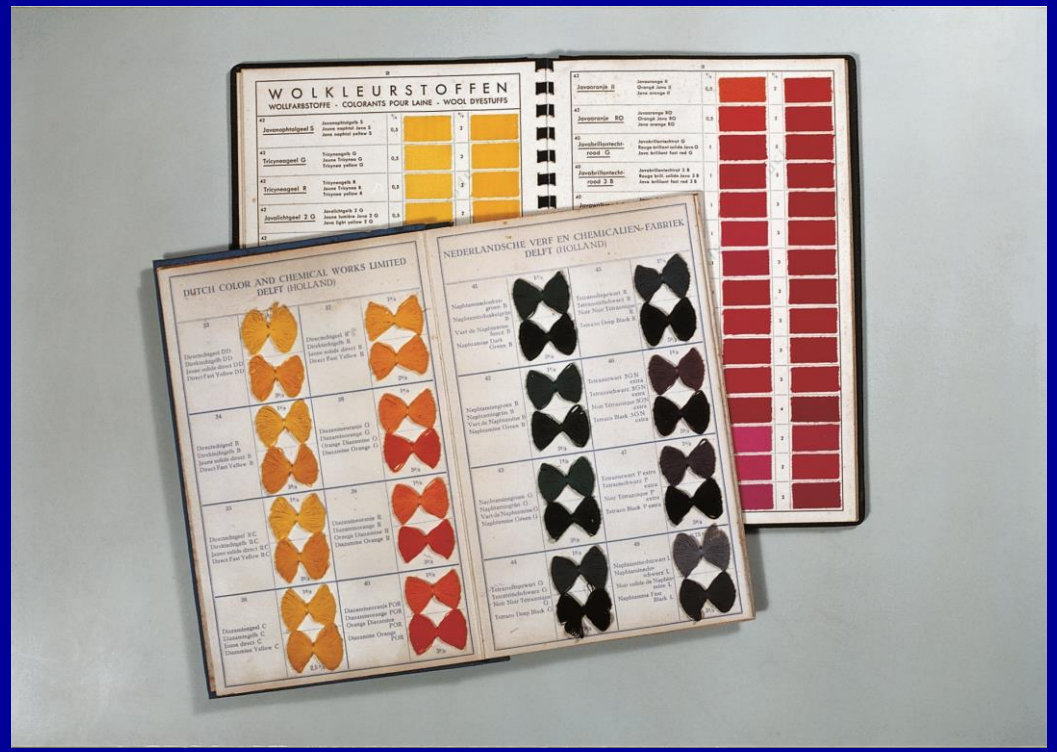


The (pre-modern) market as information system

- No feedback loop between end-user and original producer
- Three tests on three different criteria (1. purity; 2. response to light; 3. interaction with fibre and chemicals)

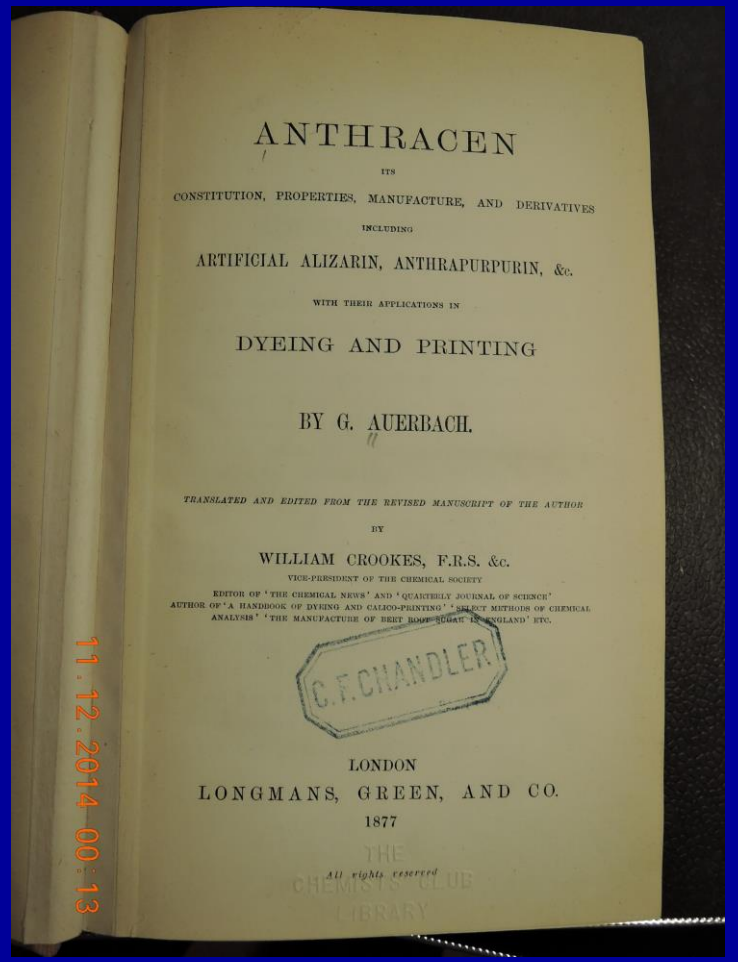
- French madder industry started to sell directly to dyers and printers
- Idem, dyestuffs preparations
- Idem, German synthetic dye industry: sample books in marketing

- Details of Dutch madder testing perfectly support Alexander Engel’s thesis on feedback



The illusion of the chemical dream

- Since 1770s many attemps to employ chemical methods for characterisation of dyestuffs (Nieto-Galan's book)
- Both chemical tests + search for 'active principles'
- Robiquet's and Colin's 'alizarin' 1827. But there are dozens of other anthrachinon etc. derivatives in natural madder
- Cf. the white lead story
- For the unification of markets the organization power of the dye companies was more important than chemistry


ANTHRACEN

ITS

CONSTITUTION, PROPERTIES, MANUFACTURE, AND DERIVATIVES

INCLUDING

ARTIFICIAL ALIZARIN, ANTHRAPURPURIN, &c.

WITH THEIR APPLICATIONS IN

DYEING AND PRINTING

BY G. AUERBACH.

TRANSLATED AND EDITED FROM THE REVISED MANUSCRIPT OF THE AUTHOR

BY

WILLIAM CROOKES, F.R.S. &c.

VICE-PRESIDENT OF THE CHEMICAL SOCIETY

EDITOR OF 'THE CHEMICAL NEWS' AND 'QUARTERLY JOURNAL OF SCIENCE'

AUTHOR OF 'A HANDBOOK OF DYEING AND CALICO-PRINTING' 'SELECT METHODS OF CHEMICAL ANALYSIS' 'THE MANUFACTURE OF BEET ROOT SUGAR IN ENGLAND' ETC.

LONDON

LONGMANS, GREEN, AND CO.

1877

Decline of the madder industry

- Prices went down from fl. 27 per 50 kilos in 1872 to fl. 17 in 1873. Decline of prices continued until 1885
- From ca. 130 madder factories in 1870-1872 to 29 in 1897.
- Complete collapse of the British and Russian markets. In the USA import of alizarin was prohibited for some years + madder used for Turkey red dyeing.
- 1874: 2695 ha
- 1875: 1651 ha
- 1876: 960 ha
- 1877: 497 ha
- 1878: 124 ha

That’s why the word madder is so unknown…

- Sugar beets replaced madder on the fields: sugarbeet factories.
- Some madder stoves converted to chichory works during World War I.
- Shortly after World War I: closure of the last madder factories.

Questions ??