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# UNIT 22 TECHNOLOGY AND CRAFTS

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## 22.0 OBJECTIVES

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This unit introduces you to major crafts and technology that existed during the Delhi Sultanate. After reading this Unit, you would learn about the following:

- Agricultural technology,
- Textile technology,
- Building Construction,
- Papermaking and Bookbinding,
- Military technology,
- Tincoating,
- Glass manufacture,
- Shipbuilding, and
- Distillation.

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## 22.1 INTRODUCTION

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There has never been any human settlement which did not use some kind of technique or craft for its survival. In fact, the history of technology is no less important than political or economic studies. Technology is an inseparable part of the material culture of a society.

In this Unit, we are offering you a few glimpses of the state of Technology in India during the Delhi Sultanate.

Therefore, our methodology is to juxtapose the indigenous crafts and technology along with the new importations.

One thing that will strike you is that by and large the tools, devices and implements were made of wood and earth, while iron was employed only when most necessary. Ropes, leather and bamboo, too, were used when the need arose. That is why they were inexpensive.

We have not gone into the details of tools and implements used by different craftsmen. For example: hammer, saws, **basola** (adze), **randa** (plane), awl, axe, **barma** (bow-drill), pick-axe, shovel, chisel (**tesha**) and anvil, etc.

We have also left out mining and metallurgy. For the latter, it may be pointed out that smelting of ore was carried out by using wood and charcoal. There was no "blast" furnace, but bellows served this need. Salt and diamond mining were very important industries. Salt was also procured by the natural evaporation of the saline sea-water collected systematically.

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## 22.2 AGRICULTURAL TECHNOLOGY

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In this section we will discuss the main technological devices related to agriculture.

### 22.2.1 Plough

The use of hoe or hoeing was replaced by plough centuries back. Archaeological evidence from Kalibangan (Rajasthan) – an Indus valley culture site – for the use of 'ironless' plough is well-known, although the doubt remains whether it drawn by men or oxen. Plough-cultivation employing oxen during the Vedic Age is, however, an established fact. The Iron Age, identified with the Aryan settlement in the Gangetic plain, contributed to the development of the plough in the sense that while the entire frame earlier was of timber, the ploughshare/courter now was of iron. This metallic piece immensely helped in the tillage of comparatively harder soil. An illustration in the **Miftah-ul Fuzala** – a Persian lexicon compiled in about A.D. 1460 in Malwa – clearly shows the plough with an ironshare drawn by two yoked oxen. Unlike Europe, India could not develop horse-drawn wheeled-plough for the reason that our plough was light in weight suited for the soft soil.



### 22.2.2 Sowing

For sowing, the method of broadcasting was known. The practice was to scatter seeds manually by taking them out from a cloth-bag slung over shoulders. The time-scale of seed-drill in India is controversial : some would trace it back to the Vedic Age. At any rate, the only positive evidence for its use along the western coast of India comes from one Portuguese — Barbosa (c. 1510) — in connection with the wet-cultivation of rice.

### 22.2.3 Harvesting, Threshing and Winnowing

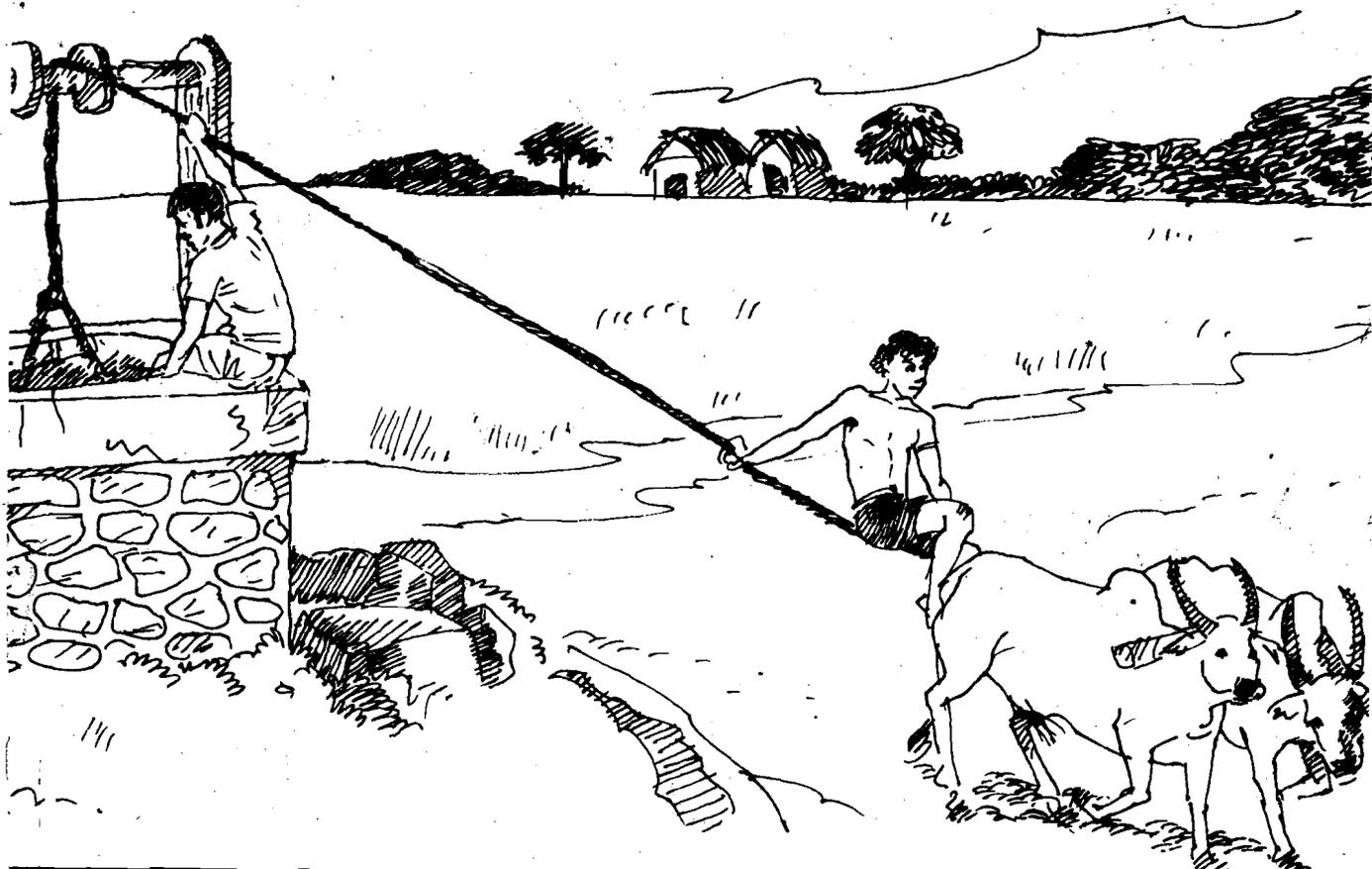
Harvesting was performed with a sickle, and threshing by using oxen who walked round and round over the ears put on the threshing floor. "Wind power" was exploited in winnowing in order to separate the chaff from the grain.

### 22.2.4 Irrigational Devices

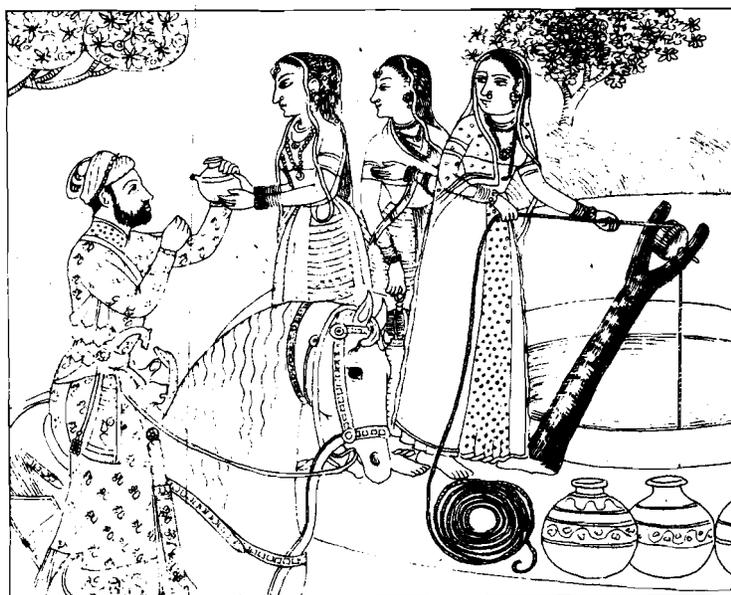
There were many sources of water for the purpose of irrigating fields. Rain water was the natural source. Ponds and tanks received this water which was used for irrigation. Water channels formed by inundation, too, served the same purpose. But the most important controlled source was the water of the wells, especially in North India. Almost all the irrigational devices were oriented towards drawing water from wells. The latter were more often than not masonry ones with raised walls and enclosures/ platforms. **Kuchcha** wells also existed, but these could not have been durable or strong enough for extensive water-lifting.

Broadly, there were five devices or techniques to raise water from wells:

- i) The most simple technique was to draw water with rope and bucket by using hands without any mechanical aid. Obviously, then, the bucket was small in size and, thus, this operation would not have adequately served to water large fields. But we cannot deny the use of rope-bucket technique for irrigating small fields for crops, most probably vegetables that did not require much water.
- ii) The second method was the employment of pulleys (**charkhi**) combined to the rope-bucket contraption which was, once again, activated manually. Undoubtedly, the pulleys needed lesser amount of human energy and, therefore, comparatively larger bags or buckets could have been attached to the rope. It was also used for domestic purpose, especially by women.



- iii) An improved method of the rope-bucket-pulley contraption was the employment of a pair of oxen to replace human-power. At this stage, it had become a specialized device for drawing water intended specifically for irrigation. In some areas of North India it is still in operation known as **charasa**. The latter is a huge bag that gives an idea of the immense quantity of water raised from the well in one single haul-up. Moreover, the bullock track was like a ramp or sloping path—the length of the path corresponding to the depth of the well. The water of the well (mounted with this device) could not have been used for drinking, cleansing utensils or for washing cloths. Of all the five methods, **charasa** was not a multi-purpose one, it was solely devised for irrigation — a fact which has not been realized till now.



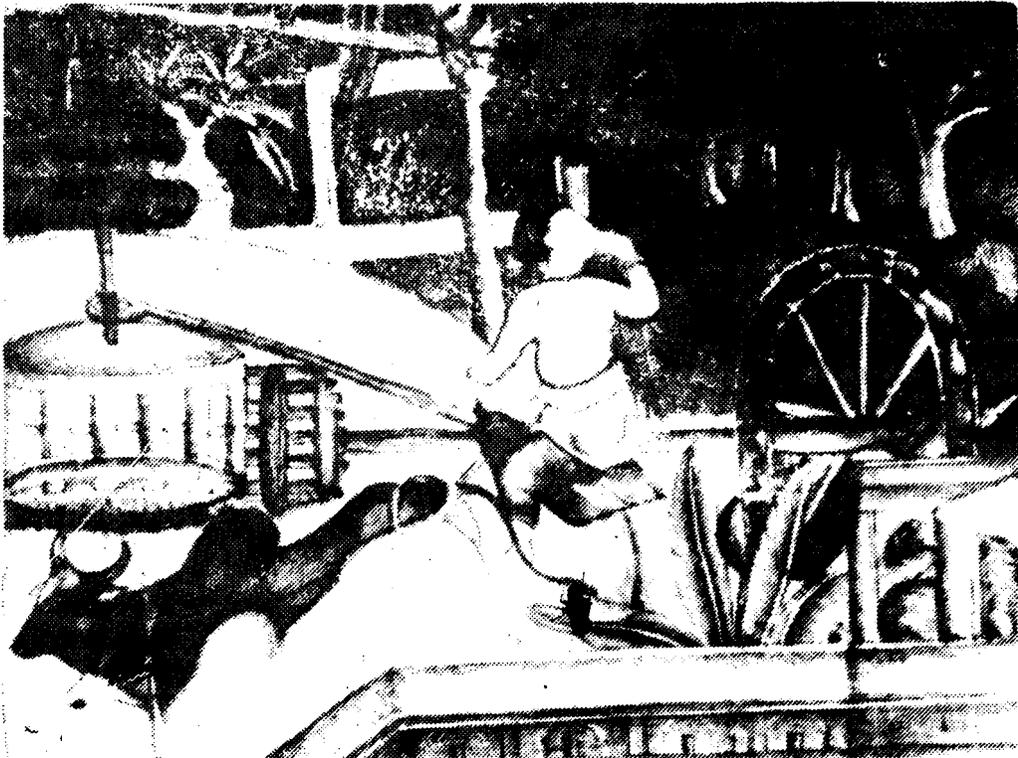
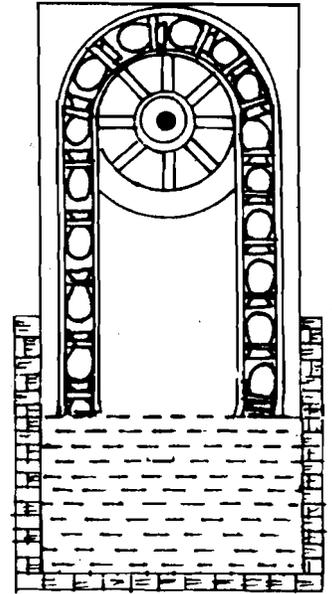
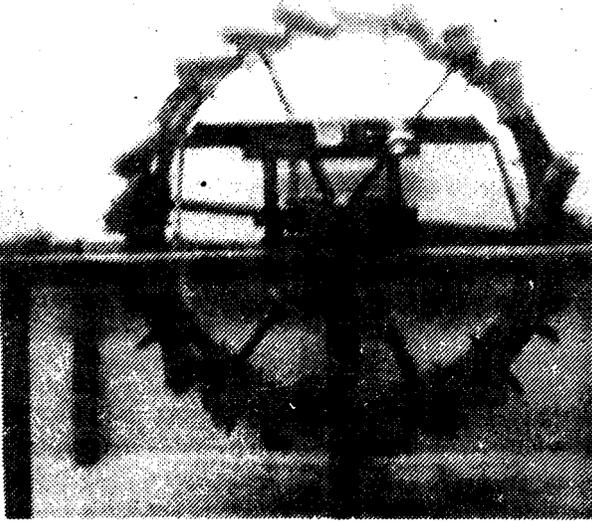
4. use of pulley



5. Dhenkli

- iv) The fourth technique was what is considered to be semi-mechanical as it worked on the First Class Lever principle. A long rope is lashed to the fork of an upright beam or trunk of a tree (especially meant for this purpose) to put it in a swinging position. The bucket is fastened to a rope whose other end is tied to the one of the the swinging pole hovering over the well. The pole's other end carries a 'counterweight', a little heavier than the bucket when filled with water. Thus, the fulcrum forms at the centre of the pole, with weight and 'counterweight' (Effort) at its two ends. This contraption requires only a little effort on the part of the person operating it. The device is known as **shaduf** in Egypt. It is called **tula** (balance) in Sanskrit, but in Bihar and Bengal it's known as **dhenkli** or **lat/latha**.
- v) The fifth water-lifting method is called **saqiya** or 'Persian Wheel'. None of the four mechanism described above required **wheels** as their basic component. This water-wheel could well claim to be called a water **machine** because of the employment of the gear system. With gears we enter upon a very advanced stage in the technological sense: it has been surpassed only now by electric tube-wells.

Much controversy has cropped up about the origins of **saqiya**: did it exist in India prior to the advent of the Muslims, or was it a foreign importation through the agency of the Turks? In India, its earliest form was one wheel with pitchers or pots of clay attached around the rim of the wheel. It was called **arashtra** or **arashtra** in Sanskrit



6. (a) First stage of noria  
(b) Second stage of noria: an imagery model  
(c) Saqya: third stage of noria. See three wheels with gear mechanism;

by human power only. Its form itself forced it to be set up over shallow water or open surfaces—stream, reservoir or even rivers where water would level up to its banks. Thus, its use over wells was absolutely out of question.

The second stage was to exploit it over wells. This was done by releasing the earthen pots fitted around the rim of the wheel and, in its place, a chain or garland (Hindi: **mala**) of pots was provided which was long enough to reach the water level of the well. The **mala** or chain was made of double ropes without open ends between which the pots were secured with timber strips. It is important to note that there is no separate term for this contrivance in Arabic or Persian. In Sanskrit, however, it was called **ghatiyantra** (pot-machine), although the words **araghatta** and **arahatta** continued to be used for both the types of noria. This, too, was operated by human-power.

At the third and final stage, we find three developments to have taken place:

- a) addition of two more wheels;
- b) gear mechanism; and
- c) the use of animal power.

The lantern-wheel provided with vertical pegs at regular intervals, was set up on an upright axle to be moved by animal power round and round horizontally. The pin-wheel was arranged vertically with a shaft or axle connected to the third wheel over the well that carried the pot-garland. This was, then, the gear system in order to exploit animal power. Essentially, the point was to convert the original horizontal motion of the lantern-wheel into a vertical one for the wheel set up over the well.

The confusion of some modern scholars in this controversy is to identify the two first stages of noria with **saqiya**. But now you know that the latter was radically different not only in its conception but also in its components. A semantic blunder was committed when the same terms—**araghatta** and **arahatta** (modern **rahat**)—were used for the **saqiya** when the Muslims brought it in early medieval period. In fact, there is no evidence of water-wheels being operated by animals in Ancient India.

The five devices to raise water from wells described above can be put into two broad categories:

- a) Intermittent or Discontinuous water-supply device, and
- b) Continuous supply system.

The greater part of the Hindūstān country is situated on level land. Many though its towns and cultivated lands are, it nowhere has running waters. Rivers and, in some places, standing-water are its "running-waters" (**āqār-sūlār**). Even where, as for some towns, it is practicable to convey water by digging channels (**āriq**), this is not done. For not doing it there may be several reasons, one being that water is not at all a necessity in cultivating crops and orchards. Autumn crops grow by the downpour of the rains themselves; and strange it is that spring crops grow even when no rain falls. To young trees water is made to flow by means of buckets or a wheel. They are given water constantly during two or three years; after which they need no more. Some vegetables are watered constantly.

In Lāhor, Dībālpūr and those parts, people water by means of a wheel. They make two circles of ropes long enough to suit the depth of the well, fix strips of wood between them, and on these fasten pitchers. The ropes with the wood and attached pitchers are put over the well-wheel. At one end of the wheel-axle a second wheel is fixed, and close (**qāsh**) to it another on an upright axle. This last wheel the bullock turns; its teeth catch in the teeth of the second, and thus the wheel with the pitchers is turned. A trough is set where the water empties from the pitchers and from this the water is conveyed everywhere.

In Āgra, Chandwār, Bīāna and those parts, again, people water with a bucket; this is a laborious and filthy way. At the well-edge they set up a fork of wood, having a roller adjusted between the forks, tie a rope to a large bucket, put the rope over the roller, and tie its other end to the bullock. One person must drive the bullock, another empty the bucket. Every time the bullock turns after having drawn the bucket out of the well, that rope lies on the bullock-track, in pollution of urine and dung, before it descends again into the well. To some crops needing water, men and women carry it by repeated efforts in pitchers.



3) Mark (✓) against the right and (×) against the wrong statements given below:

- i) **Kuchcha** wells were durable for extensive water-lifting.
- ii) **Dhenkli** worked on the First Class Lever principle.
- iii) In **saqiya** gear mechanism and animal power was used.
- iv) **Charasa** was mainly used for domestic purposes.

## 22.3 TEXTILE TECHNOLOGY

During the sultanate period various new techniques were introduced by the turks in the field of textile.

### 22.3.1 Ginning, Carding and Spinning

Cotton cultivation belongs to agricultural technology. After picking up cotton balls, there were three basic stages before cotton could be used for weaving:

- i) ginning or seed extraction;
- ii) carding or fibre loosening; and
- iii) spinning or making yarn.

The first was done in two ways:

- a) roller and board method, and
- b) worm-press or worm-roller (**charkhi**).

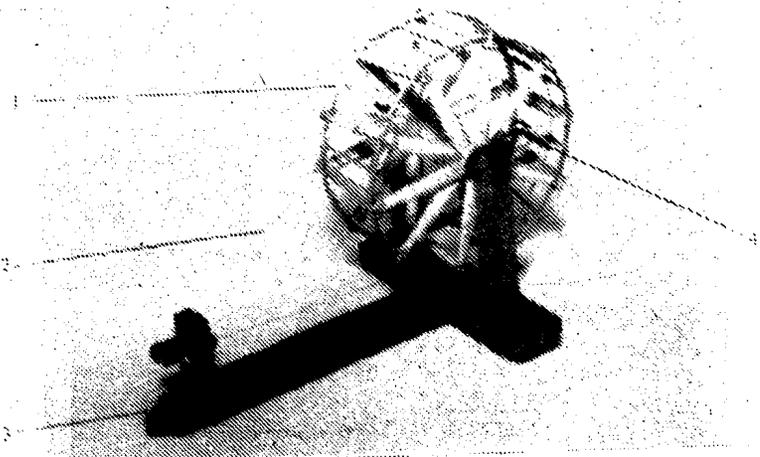
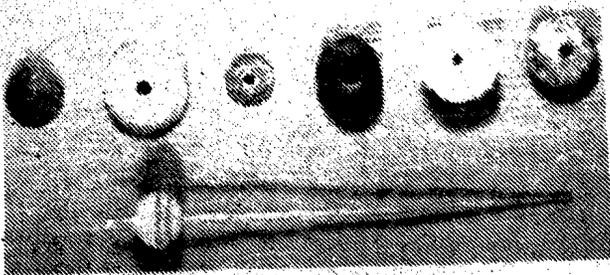
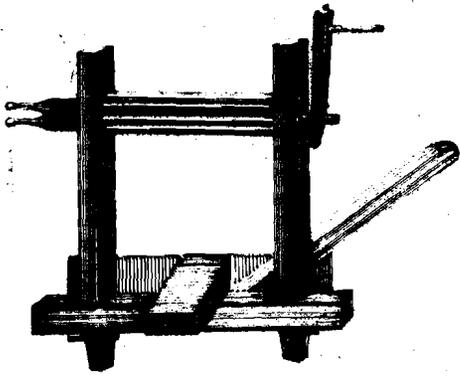
Cotton thus separated from seeds was "beaten" with sticks or carded with bow-string in order to separate and loosen the fibers (**naddafi** in Persian; **dhunna** in Hindi). Spinning was traditionally done with the spindle (**duk** in Persian; **takla** in Hindi) to which a whorl (**phirki** in Hindi) was attached to stabilize it.

The most important technological revolution in the textile sector was the introduction of the spinning-wheel (**charkha**) through the agency of the Muslims during the 13th-14th centuries. **Charkha** did not exist in Ancient India. The first literary reference to **charkha** comes from Isami's **Futuh-us Salatin** (A.D. 1350). This new contribution, however, did not displace the spindle: it only accelerated the latter's rotation. The spindle was attached to the wooden frame of the **charkha** at its one end to be set in motion by the "belt" which was wrapped over the wheel at the other end of the frame, connecting it to the spindle. Thus, the **charkha** combined within itself the element of power-transmission (through belt-drive) and the principle of flywheel resulting in differential speeds of rotation. There is a controversy about the date as to when a handle or crank-handle was attached to the device. But this controversy can be now settled with the help of a pictorial evidence (c. A.D. 1530) in the **Miftah-ul Fuzala** where a spinning-wheel has been shown being operated with a handle attached to the frame.

According to one estimate, a spinning-wheel could produce yarn six-fold more than the spindle during the same unit of time. This must have resulted in greater output of yarn and, constantly, more cloths. It must be pointed out that the yarn from spindle was of a very fine quality whereas the **charkha** produced coarse yarn for coarse cloths.

### 22.3.2 Weaving

Horizontal loom of throw-shuttle type was used for simple or tabby weave. It is difficult to determine whether the pit-loom (treadle loom) was in use in Ancient India, but we get the first evidence of this loom in the **Miftah-ul Fuzala** (c. A.D. 1469) illustrated in c. 1530. This loom allowed the weaver to employ his hitherto idle feet to lift and depress the sets of warp threads, while his hands worked mainly upon the shuttle and the shed. This speeded up the pace of weaving. For patterned weave (of different colours simultaneously), one scholar suggests that draw-loom for this purpose might have existed in South India around A.D. 1001. But this view has been questioned by arguing that perhaps it was brought to India by the Muslims late in the 17th century.



7. (a) Ginning: roller and board method
- (b) Carding
- (c) Spindle
- (d) Spinning with the spindle
- (e) Spinning-wheel: 1 spindle 2. belt



9. Pit-loom, a 16th century Mughal painting (Kabir)

### 22.3.3 Dyeing and Printing

Various colours derived from vegetable and mineral sources were used for dyeing. Indigo, madder and lakh, etc. were widely employed. Indigo was used for both bleaching and dyeing. For fast colours, many articles like alum were added. The Indian dyer (**rangrez**) employed many techniques like immersion, tie-and-dye (**bandhana**), etc. But block-printing (**chhapa**) was perhaps unknown in Ancient India. Some scholars credit the Muslims with its diffusion in India.

#### Check Your Progress 2

1) State the methods used for ginning during the 13th-15th centuries.

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2) Write a note on spinning-wheel.

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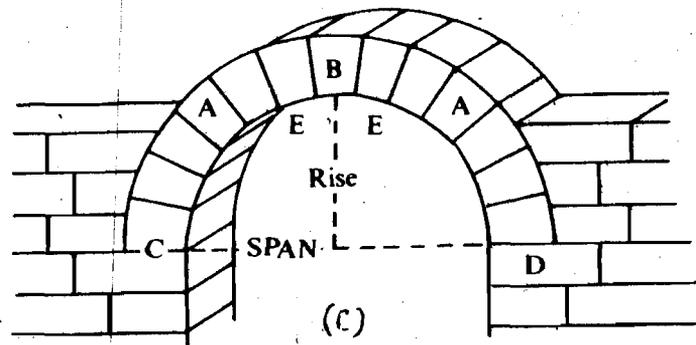
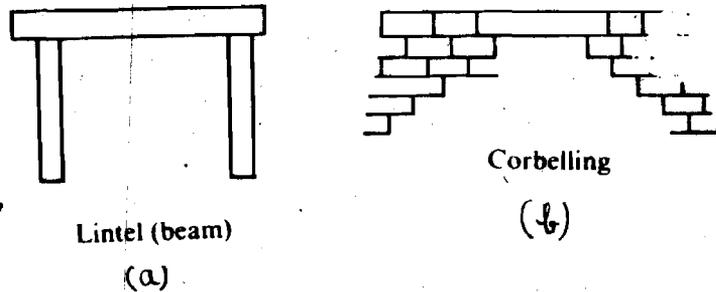
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|---------------|-----------|---------------------|
| A : voussoirs | vorsseirs | C : springing lines |
| B : keystone  |           | D : abutment        |
|               |           | E : crown           |

10. (a) Pillar-and-beam  
 (b) Corbelled  
 (c) Arch and its parts (a) Voussoirs (b) Key stone

## 22.5 PAPERMAKING AND BOOKBINDING

Now you know how the immigrant Muslims acted as agents of diffusion for numerous techniques and articles of technology that had developed or evolved in the Islamic culture area. Papermaking was yet another contribution.

The writing materials in Ancient India were many: stones, copper plates, silk and cotton cloths, and specially prepared palm-leaves (**talpatra**) and birch-bark (**burjapatra**). The latter two were employed for writing books.

Paper was first manufactured in China around the first century A.D. It was made from bamboo pulp. The Muslim Arabs learnt papermaking from some Chinese who were taken prisoners in a battle in A.D. 751. Very soon the Arabs developed this craft by making paper from rags and old linen.

The Indians perhaps knew about paper in the 7th century A.D., but they never used it as writing material. When the Chinese traveller I-Ching visited India, he could not find paper to copy the Sanskrit manuscripts for being taken to China. Since he had exhausted his own stock, he sent a message to his friends in China to send paper to him.

During the Delhi Sultanate, paper was used for many purposes, especially for books, **farmans** and numerous commercial and administrative documents. Paper was available on a large scale so much so that sweetmeat-sellers of Delhi delivered sweets to the buyers in paper packets called **purya** which is still the practice in India. But it seems that papermaking centres were few and far between. We know from the 14th century Chinese navigator, Ma Huan, that Bengal produced paper. However, the bulk of paper needed was imported from Islamic countries, specially Samarqand and Syria.

The practice of writing books on paper was accompanied by the craft of bookbinding which was an innovation in India, because the technique was different from that followed in India, for putting sheets of writing material together (palm-leaves and birch-bark).

### Check Your Progress 3

- 1) Discuss the contribution of the Turks in the field of building construction technology.

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- 2) Write five lines on papermaking in India.

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## 22.6 MILITARY TECHNOLOGY

In this section, we will deal with three things only:

- i) stirrup,
- ii) horseshoe, and
- iii) gunpowder.

### 22.6.1 Stirrup

It is now an established fact that iron-stirrup (**rikab**) was unknown in India. For that matter, there is no Sanskrit word for stirrup. Perhaps surcingle, 'big toe stirrup' and 'suspension hooks' were used in India, but stirrup proper was the contribution of the Muslims. This stirrup was first used in China around 6th century A.D., and later it diffused into Persia and other Islamic countries during the next century. A Persian

(For the military advantages of stirrup, see the passage in the box)

The history of the use of the horse in battle is divided into three periods: first, that of the charioteer; second, that of the mounted warrior who clings to his steed by pressure of the knees; and third, that of the rider equipped with stirrups. The horse has always given its master an advantage over the footman in battle, and each improvement in its military use has been related to far-reaching social and cultural changes.

Before the introduction of the stirrup, the seat of the rider was precarious. Bit and spur might help him to control his mount; the simple saddle might confirm his seat; nevertheless, he was still much restricted in his methods of fighting. He was primarily a rapidly mobile Bowman and hurler of javelins. Swordplay was limited because without stirrups your slashing horseman, taking a good broadhanded swipe at his foe, had only to miss to find himself on the ground. As for the spear, before the invention of the stirrup it was wielded at the end of the arm and the blow was delivered with the strength of shoulder and biceps. The stirrup made possible — although it did not demand — a vastly more effective mode of attack: now the rider could lay his lance at rest, held between the upper arm and the body, and make at his foe, delivering the blow not with his muscles but with the combined weight of himself and his charging stallion.

The stirrup, by giving lateral support in addition to the front and back support offered by pommel and cantle, effectively welded horse and rider into a single fighting unit capable of a violence without precedent. The fighter's hand no longer delivered the blow; it merely guided it. The stirrup thus replaced human energy with animal power, and immensely increased the warrior's ability to damage his enemy. Immediately, without preparatory steps, it made possible mounted shock combat, a revolutionary new way of doing battle.

11. Lynn White, *Medieval Technology and Change*, London, 1973, pp 1-2.

### 22.6.2 Horseshoe

While some scholars of Medieval India look at the stirrup as a contributory factor to the series of military successes that the Turks achieved in India—at least in the initial stages of their invasions—horseshoe (नाल) has been treated as its poor cousin.

Domestication of horse was not enough. With the view of controlling the horse for riding, some equipments were called-forth; viz., simple bridle, bitted bridle, saddle with pommel and cantle and, of course, the stirrup.

Nailed horseshoe was a late comer. It is interesting to note that horseshoe is the only equestrian accoutrement which does not have direct bearing on controlling the animal like other outfits. If so, then, why shoeing was needed? The answer lies in the hoof, the most vulnerable part of the equine anatomy. The horse's hoof is a constantly growing horny structure like the human nails, susceptible to breaking, splitting and shelling. In their original natural habitat horses keep their feet worn down and, hence, trimming is unnecessary. But tamed and domesticated horses when in use, require shoeing, specially in moist latitudes. A horse with footsore will limp and, hence, of little use to the rider. Shoeing offers two advantages; first, it gives a better grip on soft ground; and secondly, the hooves get protection on rough ground. It is in this context that we can appreciate the worldwide axiom of horsemen: "No foot, no horse". A lame cavalry horse may often be worse than no horse at all.

Horseshoes have not been reported from any archaeological site excavated in India. It is now an incontrovertible fact that horseshoes were foreign importations, brought by the Turks when they came to India. The Arabic/Persian word for the shoe is ना'ल (the farrier or shoemaker is ना'लबंद and shoeing is ना'लबंदी). Sanskrit literature on horses (Salihotra) do not mention shoeing, (a case similar to stirrup and spinning-wheel). It is no accident, then, that shoeing in the past was largely monopolized by Muslim artisans. At any rate, our sources yield information for cold-shoeing only – not hot-shoeing as it was practised in Europe.

### 22.6.3 Gunpowder and Fire-Arms

Many decades ago, some scholars, both European and Indian, were keen to prove that gunpowder and fire-arms were used in Ancient India. Among the Sanskrit sources, the **Sukraniti** became the focal point from which support was drawn. However, sobriety and maturity prevailed when other scholars dismissed their inferences, especially after careful examination of the **Sukraniti**. Again, untenable attempts were also made to show that the Muslims who came to India following the invasions of Sultan Mahmud of Ghazna used fire-arms.

Gunpowder consists of saltpetre, sulphur and charcoal, and it was first invented in China. Later, it spread to the Islamic society. The immigrant Turks brought gunpowder to India perhaps in late 13th or early 14th century. But it must be pointed out that even by the reign of Sultan Feroz Shah Tughluq its only use was for pyrotechny or fireworks (**atashbazi**), not for fire-arms or for propelling cannon-balls. Fire-arms were used for the first time during the second half of the 15th century in some regions of India like Gujarat, Malwa and the Deccan. At any rate, the use of fire-arms on a regular basis was introduced by the Portuguese when they came to Calicut in A.D. 1498, and by Babur in North India in the early 16th century.

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## 22.7 TINCOATING

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Domestic utensils of copper (and brass) are prone to acid poisoning from sour food kept in them. A coating of tin is given to them frequently, specially inside, to protect them from the chemical action of acid food. This craft came to India along with the Turks. There is no reference to this technique in Ancient India. Apart from literary sources, the archaeological evidence comes from an excavation site in the South (near Kolhapur) where a copper container with tincoating both on its interior and exterior was discovered. Since, this vessel was found in association with the coins of the Bahmani dynasty (A.D. 1347-1538), it must belong to that period.

The craftsman who does tincoating is called **qala'igar** (**qalai=tin**). Tin (**ranga**) is a highly malleable and ductile metal, and its coating over metallic vessels protects the latter from corrosion and chemical poisoning. The craftsman first cleanses the utensils to remove dirt, etc. After this, the vessels are mildly heated over a small furnace with charcoal. Small bellows are used to maintain the required degree of heat. The next process is to apply a mixture of pure tin and salammoniac (**nosadar**) with a cotton pad. The salammoniac vapourizes leaving a metallically clean surface. Meanwhile the tin melts and by constant rubbing of the pad it is evenly distributed over the whole vessel — outside and inside.

Abul Fazl refers to tincoating in the **Ain-i Akbari**. He says that copper utensils of the royal kitchen are tinned twice a month, but those of the princes, etc. once.

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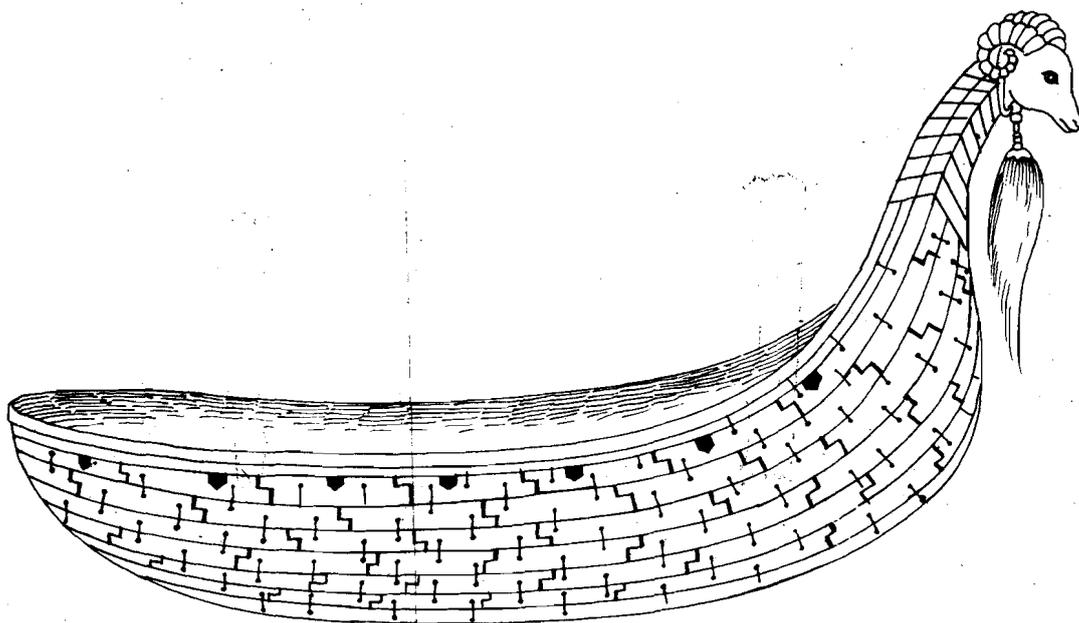
## 22.8 GLASS MANUFACTURE

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The earliest use of glass in India has been set somewhere during the first millennium B.C. But the presence of an object in a society may reveal its possible use but does not necessarily imply a knowledge of technology also. However, glass was not scarce in India: perhaps long familiarity with imported glassware must have led to indigenous manufacture. But Indian glass objects "did not range or go beyond the manufacture of tit-bits like beads and bangles". With the Muslim advent, pharmaceutical phials, jars and vessels started coming to India from the Islamic countries. It is not possible to determine whether the above glassware actually fabricated during the Delhi Sultanate in imitation of these importations. However, during the period of study, we draw blank when we look for the manufacture of articles of glass like glass lenses for spectacles or looking-glasses (mirrors were made of copper or bronze with polished surface).

## 22.9 SHIPBUILDING

The entire frame of boats and ships were made of timber like everywhere in the world. The planks were first joined by the rabbeting or tongue-and-groove method. Then they were sewn with ropes made from the coconut husk. Sometimes wooden nails were also used. But iron nails and clamps to join the planks was a later development under the influence of European shipbuilding after A.D. 1498. Anchors were made of stones: later, Europeans introduced iron anchors.



17. Rabbeting and the use of iron nails to join the planks

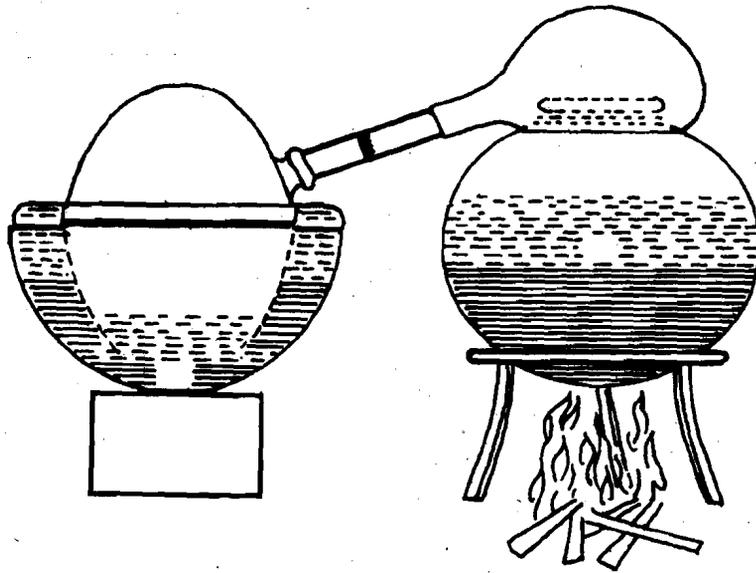
For navigation, magnetic compass was a great contribution which the Muslims diffused in India.

## 22.10 DISTILLATION

There has never been any society that did not produce intoxicating drinking substances. **Soma** in the Vedic Age was one such intoxicants. There are two ways to get wine: fermentation and distillation. The first was widely known in the world. Wine was procured by fermenting rice, sugarcane juice, **mahuwa** flowers, etc.

Distillation was a late comer. Some think that it was first discovered in Italy in the 12th century A.D. For India, there is an opinion that distillation was a contribution of the Turks.

This view is not acceptable. Excavations at Sirkap (Taxila) and Shaikhan Dheri, now in Pakistan, have yielded distillation apparatus like *these* condensers and parts of still, many of which are now lodged in the Taxila Museum. This apparatus belong to the period from 2nd century B.C. to 2nd century A.D., much before the Turks came to India. However, we may give credit to the Turks for its eastward diffusion.



17. Reconstruction of distilling apparatus(after Marshall, 1953)

**Check Your Progress 4**

1) Define the following:

Stirrup

.....  
 .....  
 .....

Horseshoe

.....  
 .....  
 .....

2) Fill in the blanks:

- a) Gunpowder was invented in .....
- b) Fire-arms were first used in India during the .....
- c) Technique of tinfoating in India was introduced by the .....
- d) To join the planks ..... method was used.
- e) Distillation technique was known in India during

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**22.11 LET US SUM UP**

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You must have learnt from this Unit something about the techniques or methods by which the people during the Delhi Sultanate fabricated or produced articles of daily use. Concerning agriculture now you know about ploughs with iron share, methods of sowing, irrigational devices, harvesting, threshing and winnowing. In the section on textile crafts, you have read about ginning, carding, spinning, weaving, dyeing and printing. As regards building construction, lime mortar, true arches and domes/vaulted roofings are most important. Papermaking and bookbinding were new crafts. Similar is the case of military technology with reference to stirrup, horseshoe and gunpowder. Tinfoating, too, was a new technique. Glass technology was on a low level in this period. Now you know that iron was not used in shipbuilding prior to the Portuguese advent. Fermentation and distillation were used for medicinal purposes.

At the end, let us sum up the new techniques or crafts brought by the Muslims to India: saqiya, spinning-wheel, pit-loom, lime mortar, true arches, dome, paper and bookbinding, stirrup, horseshoe, gunpowder, tincoating and mariner's compass. The Indians accepted all these without hesitation or opposition.

## 22.12 KEY WORDS

<b>Accoutrement</b>	: Soldier's equipment other than weapons and clothes
<b>Alum</b>	: White mineral salt used in dyeing
<b>Arch</b>	: Curved Structure
<b>Axiom</b>	: Statement that is accepted without argument
<b>Bridle</b>	: Part of a horse's harness
<b>Contraption</b>	: Device/apparatus
<b>Equine</b>	: Like a horse
<b>Farman</b>	: Order of the Sultan
<b>Gear</b>	: Set of toothed wheels which fit into another set to transmit power
<b>Immersion</b>	: Put under the surface of a liquid
<b>Loom</b>	: Instrument for weaving cloth
<b>Gelatinous</b>	: Like jelly
<b>Glutinous</b>	: Sticky protein substance
<b>Pit-loom (treadle loom)</b>	: Loom worked by the foot
<b>Pommel</b>	: Rounded part of a saddle
<b>Planks</b>	: Long flat piece of sawn timber
<b>Pyrotechny</b>	: Fire works
<b>Pulley</b>	: Wheel with grooves for ropes
<b>Ramp</b>	: Slope
<b>Resinous</b>	: Sticky substance specially from fir and pine tree
<b>Slake-lime</b>	: Calcium Hydroxide ( $\text{Ca}(\text{OH})_2$ ): Its formed by the action of water on Calcium Oxide
<b>Tabby</b>	: Cat with grey or brownish fur and dark stripes
<b>Quick-lime</b>	: Calcium Oxide ( $\text{Ca}_2\text{O}$ ) made by heating Calcium Carbonate (limestone)
<b>Shovel</b>	: Tool like a spade with curved edges
<b>Vaulted roof</b>	: Arched roof
<b>Voussairs</b>	: Stones used in making an arch (other than the key stone)

## 22.13 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

### Check Your Progress 1

- 1) See Sub-sec. 22.2.4
- 2) See Sub-sec. 22.2.4
- 3) (i) × (ii) ✓ (iii) ✓ (iv) ×

### Check Your Progress 2

- 1) See Sub-sec. 22.3.1
- 2) See Sub-sec. 22.3.1
- 3) See Sub-sec. 22.3.2

**Check Your Progress 3**

- 1) See Sub-sec. 22.4.1, 22.4.2
- 2) See Sec. 22.5

**Check Your Progress 4**

- 1) See Sub-sec. 22.6.1, 22.6.2
- 2) (a) China (b) Second half of the 15th Century  
(c) Turks (d) rabeting (e) 2nd century B.C. to 2nd century A.D.

## APPENDIX\*

## SOME FOURTEENTH-CENTURY PASSAGES

Some of the most important passages bearing on the agrarian system of the fourteenth century are difficult to follow, and extant translations, where any exist, are not always exact. The renderings of these passages offered below are meant to be strictly literal, any departure from the original being indicated by brackets; the technical expressions are discussed in the notes which follow the translations. The clauses are set out, punctuated, and numbered for convenience of reference; the texts are continuous, and as a rule are not punctuated.

## 1. ALAUDDIN'S REVENUE DECREE

(Text, Barni, 287, Translations, Elliot, iii. 182, and J.A.S.B. vol. xxxix. p. 382, the last with Blochmann's notes).

1. Sultan Alauddin demanded from learned men rules and regulations, so that the Hindu(1) should be ground down,
2. and property and possessions, which are the cause of disaffection and rebellion, should not remain in his house;
3. and in the payment of the Demand one rule should be made for all alike from Chief to sweeper(2);
4. and the Demand on the strong should not fall on the weak;
5. and so much should not remain to the Hindu(1) that they should ride on horseback, and carry weapons, and wear fine cloths, and enjoy themselves;
6. and to make two regulations(3) in pursuance of the aforesaid object, which is the chief of all objects of government.
7. The first [regulation],—that those who cultivate whether small or great, shall cultivate according to the rule of measurement and the biswa-yield(4),
8. and shall pay half without any deduction;
9. and in this paying there should be no distinction between Chiefs and sweepers(2);
10. and not a jot should be left to the Chiefs by way of Chiefs' perquisites(5).

(The text goes on to the second regulation, imposing a tax on grazing.)

## APPENDIX

## NOTES

- 1) "Hindu." Barni uses this word in a narrow sense, to denote the classes above the ordinary peasants, so that in fact it is almost a synonym for Chiefs and headmen in this context.
- 2) "From Chief to sweeper." *Az khūta wa balāhar*. Balahar is not a Persian word, and it is quite safe to follow Blochmann in identifying it with the common Hindi name for a low-caste man employed in the village as a general drudge. In the Upper Doab, which was Barni's country, the balahar is almost always a sweeper by caste, and, since the word is obviously used to denote the lowest rank of the rural population, the rendering "sweeper" probably gives what was in the writer's mind; there is no actual English equivalent.

The word transliterated provisionally as khuta has not been found elsewhere in the literature, and has to be interpreted from the parallel passages, which are fairly numerous in Barni. It appears indifferently as khut and khuta, and these cannot be distinguished. The antithesis to balahar indicates that the khut must be looked for among the rural aristocracy, and all the passages confirm this. Khut is commonly coupled with the headman or muqaddam (e.g. 288, 291, 324, 430, 479, 554), while in two passages (288) he is linked with the chauthari, or pargana headman, as well as with the muqaddam; and his perquisites were on the same footing (430) as those of the muqaddam.

Barni does not use the word zamindar for a Chief (subject to the King) until nearly the end of his book (539, 589), and it never appears in his discussions of agrarian policy; we find khut wherever we should expect to find zamindar, and the only reasonable interpretation is that the latter word was coming into use during his lifetime, and gradually superseding khut, so that the two are in fact synonymous. If we read zamindar in every passage where khut occurs, we get perfectly good sense; if they are not synonyms, then we must hold that the important class of khuts as known to Barni, had become absolutely extinct when the next chronicler wrote, and that the equally important class of zamindars had mysteriously come into existence, a hypothesis as unreasonable as unnecessary.

The identity of the word khut is doubtful. Blochmann took it as the rare Arabic word, rendered by Steingass as "a limber twig; a corpulent man, yet handsome and active," but did not indicate how such a word could come to denote a Chief. The MSS. I have seen do not show the vowels, and it is possible that the pronunciation was different, and that we are

dealing with a word formed independently in India; but, whatever be the origin of the word, its meaning in Barni is clearly that of Chief. Blochmann arrived by analysis at the correct result, that the phrase indicates the extremes of rural society, but the rendering "landowners and tenants" which he endorsed involves both a logical non-sequitur and an historical anachronism.

The suggestion has been made that the word under discussion is really Indian in origin, being identical with the Marathi word **khot**, which is familiar in the Konkan; but the fact that Barni wrote the word with two Arabic letters (**kh** and **t**) makes its derivation from any Sanskrit language highly improbable. The word **khot** has not been traced further back than the sixteenth century kingdom of Bijapur, and a possible explanation of it is that the Arabic **khūt** passed into the Deccan at the time of Alauddin's conquest, and became naturalised there as **khot**. That there were **khots** in Gujarat also, before the Mogul conquest, appears from a document published by Professor Hodivala (*Studies in Parsi History*, p. 204), but their position is not explained; it is possible that the Arabic word, which quickly became obsolete in the North, survived in Gujarat, as in the Konkan, in an Indianised form, but more documentary evidence is necessary on this point.

- 3) This clause is ungrammatical as it stands. It would be easy to read **āwardand** for **āwardan**, putting a full stop at the end of clause 5. The translation would then be: "And two regulations were made in pursuance of the aforesaid object," which makes grammar and sense. Barni's grammar, however, is not immaculate, and the text may show what he actually wrote.
- 4) "The rule of Measurement and the biswa-yield," **hukm-i masāhat wa wafā-i biswa**. Barni mentions two "hukms" or rules for assessment, Masahat and Hāsil, i.e. "measurement" and "produce"; he does not describe the methods, but the passage which follows will make it clear that Masahat involved allowances for crop-failure, which were not required in Hasil. Unless we take these two terms to denote methods which have become entirely forgotten, we must identify them with the two which I have called Measurement and Sharing, which, as we have seen, were equally familiar to Hindus and Moslems at this period, which reappear, though with different names, in the sixteenth century, and which persisted into the nineteenth. The word Masahat gives place to **jarib** or **paimāish** in the official records of the Mogul period, but it seems to have survived in local use, for as late as 1832 the "native measuring staff" was known as the "masahat establishment" (*Rev. Sel.*, ii 378). Hasil can be read quite naturally as denoting the process of sharing the produce, and, so far as I can see, it can carry no other suggestion. The phrase "wafā-i biswa" does not occur except in Barni, and can be read here merely as a repetition or duplication of what precedes it, "reliance on the unit of area," "biswa" denoting the smaller unit, 1/20th of the bigha. Passages in the next two chronicles, however, indicate that the word wafā had acquired the technical meaning of "yield of crops," and this is probably the meaning here; "biswa-yield" would then indicate the standard outturn per unit of area, which was a necessary datum for the method of Measurement. The decisive passage is in T. Mubarak-shahi (Or. 5318, f. 34r.), where, in a description of the oppression in the River Country under Muhammad Tughlaq, we read **kisht-hā mi-paimudand wa wafā-hā farmāni mi-bastand**; "they used to measure the fields and fix the yields by ordinance." Here it does not seem possible to take wafā in any other sense. The same sense is required in Afif, 180, where the word occurs twice; and taking these examples into account, it is permissible to infer that Barni also was familiar with this technical use of the word. I have not found this use in the Mogul period, and presumably it became obsolete.
- 5) "Chiefs' perquisites"; **huqūq-i khūtān**. It can be inferred from the passage which follows that these perquisites consisted of exemption from revenue of a proportion of land, allowed to the Chiefs in return for the services they rendered; Ghiyasuddin considered that they should be satisfied with this allowance, so its amount must have been substantial, but there is no record of the extent of land allowed. The same passage shows that the Chiefs were suspected of levying revenue for themselves from the peasants: this is probably the implication of Clause 4, that the peasants were in fact paying revenue which ought to fall on the Chiefs or headmen.

## I. GHIYASUDDIN'S AGRARIAN POLICY

(Text, Barni, 429, checked by Or. 2039. Translation, J.A.S.B., vol. xl. p. 229. The translation in Elliot, iii. 230, is very incomplete.)

I applied to Mr. R. Paget Dewhurst for help with this exceedingly crabbed passage, and he generously furnished me with the following translation. The notes marked [D] are also his; the others are mine.

1. He fixed the revenue of the territories of the kingdom equitably according to the "rule of the produce"(1),
2. and relieved the peasants of the territories and the kingdom from innovations

3. and with regard to the provinces and country of the kingdom he did not listen to the tales of spies and the speeches of enhancement-mongers(3) and the bids (literally, acceptances) of revenue-farmers.
4. He also ordered that spies and enhancement-mongers and revenue-farmers and land-wreckers should not be allowed to hang (literally, wander) round the office of the Ministry,
5. and he instructed the office of the Ministry not to make an increase of more than one-tenth or one-eleventh on the provinces and country on surmise and guess-work or on the reports of spies and the representations of enhancement-mongers,
6. and that efforts should be made that cultivation should increase every year and the revenue be enhanced very gradually,
7. and not in such a way that the country should be ruined all at once by heavy pressure and the path of increase closed.
8. Sultan Tughlaq Shah frequently remarked that the revenue should be taken from the country in such a way that the peasants of the country should extend cultivation,
9. and the established cultivation become settled, and every year a small increase should take place.
10. He used to say that you ought not to take all at once so much that neither the established cultivation should be maintained nor any extension be made in the future.
11. When kingdoms are obviously ruined (literally, are ruined and show themselves ruined) it is due to the oppressiveness of the revenue and the excessive royal demand,
12. and ruin proceeds from destructive Muqtis and officials.
13. Also with regard to the exaction of revenue from the peasants Sultan Tughlaq Shah used to give instructions to all the Muqtis and governors of the territories of the kingdom,
14. that the Hindu should be kept in such a condition that he should not become blinded and rebellious and refractory from excessive affluence,
15. and that he should not be compelled by poverty and destitution to abandon cultivation and tillage.
16. The observing of the standards and principles mentioned in collecting the revenue can be carried out by typically eminent statesmen and experts,
17. and the essence of the art of statesmanship in regard to Hindus(4) is the fulfilment of the aforesaid instruction.
18. Further in regard to the collection of revenue it is related of Sultan Ghiyasuddin Tughlaq Shah, who was a very experienced, far-sighted, and prudent sovereign,
19. that he urged on the Muqtis and governors investigation and consistency in the collection of revenue,
20. so that Chiefs and headmen should not impose a separate assessment on the peasants apart from the king's revenue;
21. and if their own cultivation and pasturage be not brought under assessment, perhaps their perquisites as Chiefs and headmen, on the supposition that they pay nothing on this, may suffice them and they may make no additional demand.
22. It cannot be denied that abundant responsibilities rest on the neck of Chiefs and headmen, so that if they too contribute a share in the same way as the peasants, the advantage of being Chief or headman would disappear.
23. And as for those among the amirs and maliks (5) whom Sultan Ghiyasuddin advanced, and to whom he gave iqtas and provinces,
24. he used not to hold it permissible that they should be brought before the Ministry just like (ordinary) officials(6) and that the revenue should be demanded from them as from officials with rudeness and severity,
25. but he used to give instructions to them saying,
26. "If you wish to be exempt from the burden of being summoned before the office of the Ministry and that you should not be exposed to pressure and discourtesy,
27. and that your credit as an amir or malik should not be changed to humiliation and discredit,
28. make slender demands on your iqtas,
29. and reserve out of that slender demand something for your own agents,
30. and do not covet the smallest fraction of the pay of the troops.
31. Whether you give or do not give a little of your own to the troops rests with you

32. But if you expect a small portion of what is deducted in the name of the troops,
33. then the name of amir and malik ought not to be employed by the tongue in respect of you,
34. and the amir who devours a portion of the pay of servants had better consume dust.
35. But if maliks and amirs expect from their own country and provinces a half-tenth or half-eleventh and the one-tenth or one-fifteenth of the revenue,
36. and take the perquisites of iqta-holding and governors,
37. no occasion has arisen to forbid this to them, and to demand it back and to exact it by pressure on the amirs would be altogether deplorable.
38. Similarly if the agents and deputies(7) of the country and provinces should appropriate a half or one per cent, in addition to their salary,
39. they ought not to be disgraced for this amount, and it ought not to be recovered from them by beating and torture and imprisonment and fetters.
40. But if they appropriate considerable sums(8) and write off deductions from the revenue demand, and carry off large sums by way of mutual sharing from the provinces and country,
41. such treacherous persons and thieves should be given disgrace and humiliation with beating and torture and imprisonment and fetters, and what they have abstracted should be taken from them together with their family stock."

#### TEXT-NOTES

- CI 3. "Bids." Paz raftanihā in text is clearly a blunder for paziruftanihā [D].
4. "Land-wreckers," reading mukharrībān for muhazzibān. Or. 2039 can be so read.
  7. "not in such a way," reading na for tā, as Or. 2039.
  26. "If you wish," reading khwāhed for khwāhad, as Or. 2039.
  - "not to be exposed," reading nayuftad for biyuftad, as Or. 2039.
  38. "should appropriate," reading isābat for isāyat, as Or. 2039.

#### NOTES

- 1) "Rule of the produce," hukm-i hāsīl. See note 3 to the preceding passage.
- 2) "Crop-failure." būd wa nābūd-hā. The technical force of this phrase, literally "existence and non-existence," is fixed by Akbar's assessment rules (Ain, i. 288), in which the clerk is directed to deduct the nabud and record the bud, that is, to exclude from the measured area the area on which the crop had failed. Presumably the word apportionments, qismāt, refers to the process of classifying the area of failure. The word "nabood" survived into the nineteenth century in the wider sense of a deduction from the gross assessment (*Rev. Sel.*, i. 305).
- 3) "Enhancement-mongers." muwaffirān. This word, which is not in the dictionaries, may safely be referred to the technical sense of taufir as any secret profit derived from land. In a later passage (574), Barni uses the equivalent taufir- nūmāyān, i.e. discloser of secret profit. It is clearly a bit of office jargon, and Mr. Dewhurst adopted the expression "enhancement-monger," which I coined as a rough equivalent.
- 4) "Hindu" in this passage has obviously the same restricted meaning as in that which precedes it.
- 5) "Amirs and maliks." At this time there were three recognised titles of nobility, Khan, Amir, and Malik; here the words are best read loosely as denoting "nobles."
- 6) "Officials," āmilān, 'ummāl. The word 'āmil had not yet been specialised to denote a definite post, but meant any executive official.
- 7) "Agents and deputies," kārkunān wa mutasarrifān. Karkun is etymologically an agent. I am not clear whether by this time it had become specialised as "clerk," the meaning it usually bears in the sixteenth century; some passages can be read in this way, but others are doubtful, and perhaps specialisation was in progress, but was not complete. I have found no passage to indicate whether or not mutasarrif denoted a particular post; the word occurs in connection with the local bureaucracy, and may mean either subordinates in general, or a particular class of subordinates.
- 8) "Considerable sums," mu'tadd-hā. I take this to mean "a considerable sum," literally "a thing counted," and hence "a thing worth counting." [D]

The words iqta and Muqti, which are preserved in the translation, have been discussed in Appendix B. Their preservation is intended to bring out the force of the recurring duplications.

#### III. FIRUZ SHAH'S SECOND REGULATION

(Text, Barni, 574; no published translation has come to my notice. The chapter containing this Regulation, along with several others, is highly eulogistic and rhetorical, and too great weight must not be given to all the assertions which it contains, but there is no reason to distrust the account of the general policy adopted

- 1) **Second regulation.** It was ordered that the revenue-Demand and the poll-tax(1) shall be collected according to the "rule of the produce";
- 2) and "apportionments," and "increase of demands," and "crop-failures," and "large demands based on surmise," were entirely removed from among the peasants(2);
- 3) and revenue-farmers and land-wreckers and enhancement-mongers(3) were not allowed to infest the provinces and the kingdom.
- 4) And a reduction was made in the **mahsul-i mu'amalati**(4), so that the peasants may pay willingly without difficulty or severity;
- 5) and no roughness or violence was used towards the cultivators, who are the keepers of the treasury(5) of Moslems.

#### NOTES

- 1) The reference to the poll-tax, **jizya**, is puzzling. According to Afif (383), this tax in Delhi was a fixed sum per head payable in cash. It is possible that, in the case of peasants, it may have been assessed along with the revenue, and varied with it; but it is equally possible that the phrase is loose, "revenue and poll-tax" being used to describe the liabilities of non-Moslem subjects in general terms.
- 2) This clause must be read as enumerating the familiar exactions on the peasants. Apportionments, **qismat**, and crop-failures, **nabūdhā**, occur in the preceding passage. **Mu'taddhā** is there taken as exactions of considerable amount, and the addition here of **tasawwuri** must mean that these exactions were arbitrary, "based on surmise."
- 3) This clause also is an echo of part of the previous passage, referring to the various pests that appeared naturally in connection with the revenue-assessment.
- 4) **Mahsul-i mu'amalati**. I have not found any parallel passage to indicate the meaning of this phrase. From the context, it appears to denote some impost on the peasants, different from the **kharaj** or revenue, but its nature is a matter for conjecture.
- 5) Treasury, **hait-ul-māl**. This is a precise phrase of Islamic law, denoting the receptacle for **kharaj** and other sources of income which were in theory for the benefit of Moslems in general, though by this time in India they were in fact part of the revenue of the State.

#### IV. FĪRŪZ SHĀH'S ASSESSMENT

(Text, Afif, 94. I have found no translation; only one sentence is given in Elliot, iii, 288.)

1. The king... settled the Demand(1) of the kingdom afresh. And for the settlement of that Demand Khwaja Hisamuddin Junid was appointed.
2. The excellent Khwaja, having spent six years in the kingdom,
3. [and] having settled the Demand according to the "rule of inspection,"(2)
4. determined the "aggregate"(3) of the kingdom at 675 lakhs of tankas in accordance with the principle of sovereignty.
5. During forty years during the reign of Firuz Shah the "aggregate" of Delhi was the same.

#### NOTES

- 1) "Demand," **mahsul**. Afif occasionally uses this word in the sense of revenue Demand, that is, as a synonym for **kharaj**, never, so far as I can find, in the other sense of "produce of the soil," which occurs in some later writers.
- 2) "Rule of inspection," **hukm-i mushahada**, occurs, so far as I know, nowhere else in the literature. Barni tells us in the preceding passage that Firuz, at his accession, adopted the "rule of the produce." Afif's account refers to the same period, for this appointment was made very soon after the King's first arrival at Delhi; either then one of the writers made a mistake, or the two expressions mean the same thing. A mistake is improbable, for old bureaucrats like the writers do not misuse technical terms: on the other hand, Afif's vocabulary differs from that of Barni in several cases, such as "khut" or "pargana," so that verbal divergence need not suggest error. The general idea conveyed by **mushahada** is "witnessing," "observing"; and in order to reconcile the two statements, all that is necessary is to take this word as denoting Sharing-by-estimation, the reference being to the persons who observe or inspect the condition of the growing crop in order to estimate the yield. We may say then that, while Barni tells us that Sharing was prescribed, Afif tells us that it was Sharing by Estimation, not actual Division. On this interpretation the disappearance of the term **mushahada** can be readily understood, because the official literature of the Mogul period employs the Hindi name **kankūt** to denote the process in question.

The revenue-Demand under this system varied from season to season with the area sown and the produce reaped, so that the phrase "to settle," **bastan**, must not be read in the

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**SOME USEFUL BOOKS FOR THIS BLOCK**

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- Tapan Raychaudhri and Irfan Habib : **The Cambridge Economic History of India, Vol. I.**
- Prof. Muhammad Habib : **An Introduction to Elliot and Dowson's History of India as Told by Its Own Historians, Vol. II.**
- A.J. Qaisar : **Indian Response To European Technology and Culture.**