An Ethno-Archaeological Investigation into Irrigation Agriculture and Water Systems in Mid-Western Nepal

(Cont nued)

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Chapter 1: Irrigation Agriculture

Introduction

In most places in the hills of Nepal and to a lesser extent on the Terai, wherever there is a reasonable potential for developing irrigation the farmers have already made efforts to irrigate part of the potential command area. Recent estimates (WEC, 1981, 21) suggest that farmer-operated irrigation systems provide 93% of the hills and 74% on the Terai.

Case Study of the Salkot Irrigation Canals

Introduction

The location of these canals is within the Surkhet district, see Fig. 2, which lies in the Bheri zone of the mid-western region. I concentrated my work on a canal known as Bhiyo Pade that serves about ten villages of which Salkot, Vidyapur and Babiyachaur were the main ones.

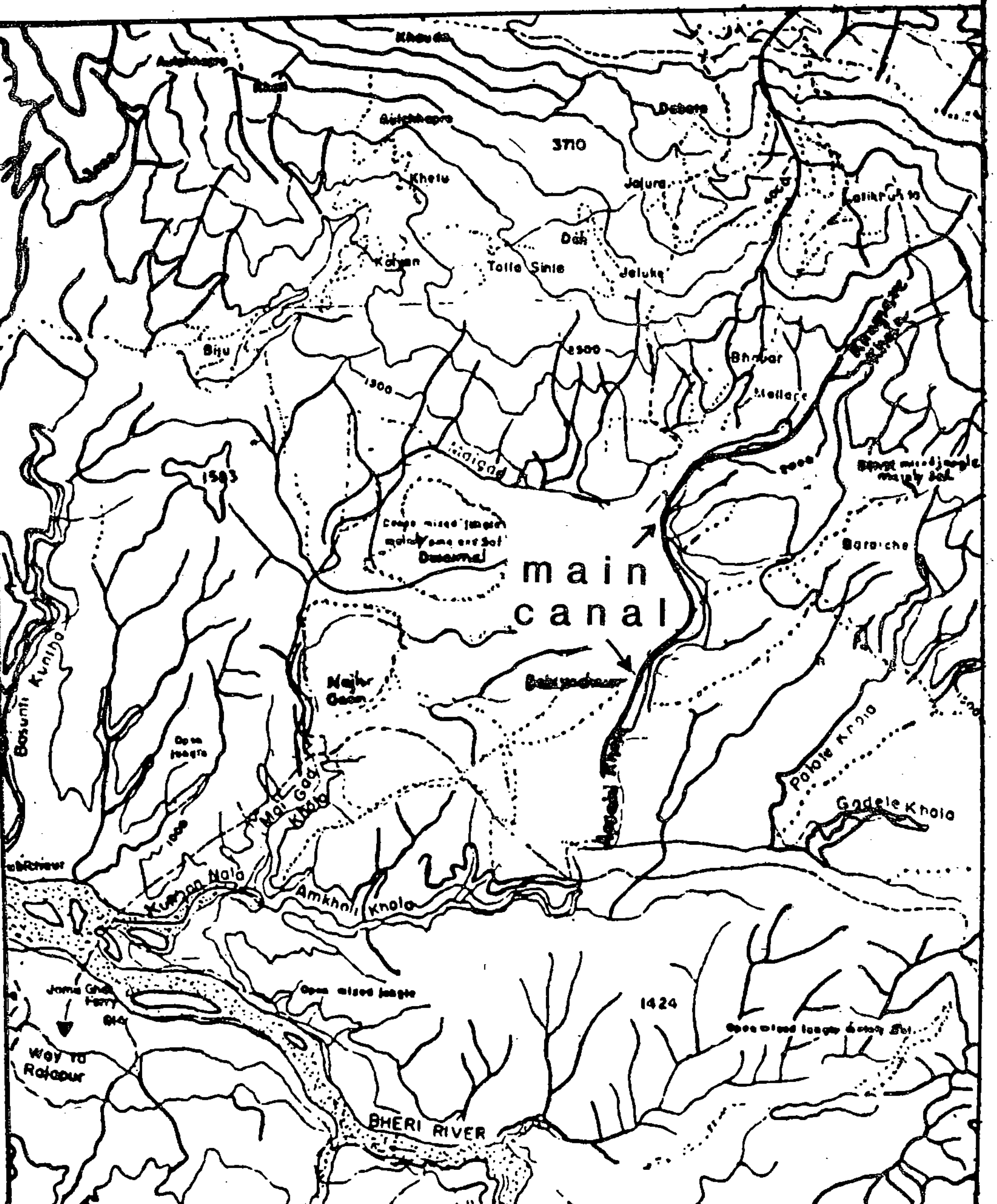
The local topography is classed as hilly elevation ranges between 700-1400m. Climate can be classified as sub-tropical. The hot months of April and May are followed by the monsoon season from June to August, and can be intense. The canals I surveyed were fed by the river Karnali which is itself snowfed.

Irrigation Tasks

Construction/Canal Dimensions

Groups of farmers in this area have worked hard to construct the main and tributary canals. The main and major tributary canals are commonly constructed of locally available materials. Their height varies from 0.6-3.4m, and width from

SALKOT CANAL SYSTEM



SCALE 1 : 2.5km

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FIG. 2

0.4-1.5m. Bank construction of the major tributary canals was commonly of long, irregularly shaped boulders at the base followed by irregularly sized and shaped river boulders. The boulders are set into an earthen bank.

Secondary tributary canals that run down and along the edge of terraces are constructed purely of mud, and are normally very narrow, commonly 30cm in width and a height of 10cm. The flow rate in this area is particularly good. I recorded on the upper main canal flows of several cubic metres per second.

Water Rights

An irrigation system must somehow allocate entitlement on rights to the water among the farmers. The principle allocation method I observed was by the selling of shares in the system. In Babiyachaur the total water supply was divided into 60 shares and 105 members own 1/8 of a share to 4 shares. If one farmer has more water than he needs for his terraces and another has less than needed, the one farmer can sell water to the other. The money is often used to make improvements in the canal so that more water could be delivered to serve a larger area.

It is important to note that there is no relationship between land ownership and water ownership in this method of water allocation. The principle of water allocation by purchase of shares offers both an incentive for efficient use of water and a mechanism for expanding the area irrigated.

Maintenance

The critical period for most farmers as I was able to observe is prior to and during the monsoon season. Failure to maintain banks can lead to collapse, see Plate No. 1. The organisational committee for the main canal meet in May where plans are made for annual maintenance which is done prior to land preparation for rice planting.

Generally the maintenance is done by small boys aged between 9 and 13. I often witnessed them scurrying along the banks with clods of mud or large stones to dam or fill breaks in the canals. Occasionally large scale work will be contracted out to one or more members of the organisation. To help with early detection of major collapse, usually two older boys especially in the monsoon season will patrol the tributary canals. If they report an emergency the leader will call all members regardless of access to benefits to report immediately for work. Work may be carried out continuously night and day until water flows again.

System Operation

I observed two systems at work on the Surkhet canals. The first is through the use of saccohos. A saccoho is a horizontal weir made from a log with two or more notches of equal depth, but varying widths cut into the top. It is installed in the canal so that all the water flows through the notches causing the flow to be divided in the same proportions as the ratio of widths of the notches. The ratio of the water allocation of the band served by the distributory canals below the saccoho is the same as the ratio of the widths of these notches. These saccohos may be used to divert a portion of the flow from the main into the secondary canals, or they may be used right down to individual terrace level. These saccohos often takes simplified form, see Plate No. 2.

Plate No. 1 – Bank collapse

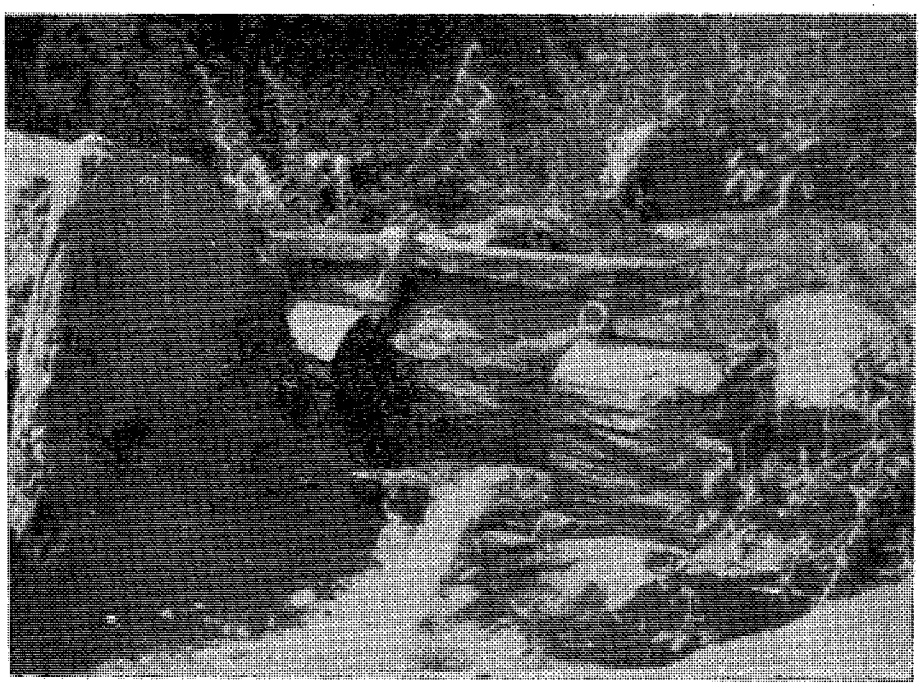

Plate No. 2– Simple Saacho

The second method I observed was by distribution by contract, where the members of the organisation pay one or more persons to deliver the water to all the fields. The contractors adjust the flow through the communal area so that all the fields are covered as adequately as possible. The method was particularly successful in Vidyapur where the fields are a long way from the village.

Water distribution for wheat and maize tends to be much less precisely regulated. Usually the farmers decide among themselves when each will irrigate his fields and then each farmer will be allowed to take water until his fields are fully irrigated. Since water is relatively scarce at the time of planting, an appointed functionary of the organisation may be in charge of distributing water so that all members are able to plant at least some of their maize at optimal time.

Conflict Management

An irrigation organisation which must distribute a limited amount of water to many members and which requires the co-operation of the members for operation and maintenance will inevitably experience conflicts.

Persons caught stealing are usually fined, occasionally the organisation might exact a public confession which is recorded in the minute book. Since the enforcement of sanctions (Singh pers comm) is in the hands of the members who benefit from the proper adherence to the rules and who control the distribution of water, there are both the incentives and the means to enforce the rules.

Dating

Dating of the main and major tributary canals is possible through the use of documents. Local panchayat members produced documents that date to the end of the Rana period, relating to land use and showed a change at that time from Beri to Khet land which is a good sign that these areas had been prepared for irrigation.

The panchayat members were able to tell me that the middle and lower half of the canal was constructed in the late 1950s (Singh pers comm). No doubt this is due to the increasing population pressure at the time, due to the movement down on to the terai with the eradication of Malaria.

Case Study of the Jumla District Canals

Introduction

The location of these canals is within the Jumla district, see Plate No. 3. I discovered three particularly interesting canals while I worked around the town of Jumla. The local thpography is more mountainous than Salkot area, though it still comes within the hill category. The elevation ranges between 7,200 ft. along the tila to 15,000 ft. along the lekhs either side of the tila. The climate can be classified as temperate- Alpine. The area is within the dry zone of north-west Nepal, here monsoon has a noticeably less effect, on average Jumla has 750mm of precipitation annually and that is largely through snowfall. The average temperature is 0-10°C, being largely controlled by altitude and slope angle.

Irrigation Tasks

Construction/Canal Dimenasions

The three principal canals I surveyed in the area varied between 0.5 and 1.5 kilometers in length. The height averaged 1.7-2m and the width 1.1-1.4m.

The three canals were indentical in construction. I found no evidence of wood or river boulders being used, they were largely constructed of compacted mud. The sides of the canals were particularly thick 1–2m. Occasionally paths ran along their tops.

The tributary canals showed more evidence of the use of river boulders their bases often being constructed of relatively large boulders, occasionally mixed with sawn timber. These canals varied tremendously in length from a few metres to a hundred. Their width averaged 0.3–0.75m, height varied from 0.4-0.84m. What was interesting about these canals is that often they would be lined with cut hollow logs which overlap each other, the longest canals run for 40m. Another interesting use of hollow logs was as aquaducts, see Plate No. 4. Some small canals whose source is often a spring will cross main canals in this fashion. The aquaducts can be merely hollow logs or large tree trunks, hollowed out. Interestingly, I observed this same arrangement in the Swiss valleys.

Water Rights

The commonest principle I observed with the Jumla systems was to divide the water in proportion to the area of land irrigated by the command area. Thus if a farmer has one twentieth of the irrigated land, he is entitled to one--twentieth of the water in the system. Many of the smaller farmers however conveyed to me in practice this did not always happen, two ruling families in the area who were also the major landowners tended to monopolise the system when shortage of water occurred.

Maintenance

Generally speaking the farmers in Jumla do not have such a problem with burst canal banks as on the Terai since the monsoon is less intense. There is a committee in charge of maintenance and similar arrangements are made as at Salkot, though generally children are not involved. I did notice that often stones would be stored in a niche of a rock, see Plate No. 5, or at the end of the terrace, especially for repair work.

System Operation

I observed one principle method of distributing water, that is according to a timed rotation. Each farmer takes water from the canal for a specified length of time. The length of each farmer's time is calculated to provide him the proportion of the flow he is entitled to by the allocation. In some of the systems small wooden storage tanks of earth and stone exist, and are used to collect small flows. The tank is emptied by discharging periodically at high flow rate to individual plots on a rotation basis. I did not observe any saccohos in the area, except in connection with gutters (water mills). Flows are commonly blocked using a combination of wood, stones and mud.

Confict Management

Conflict is very common in the Jumla system. I have already mentioned tensions between small and large farmers. Officially persons caught stealing water are fined, but as I witnessed and was verbally told by U.M.N. missionaries, their disputes are settled physically, usually by women. I saw one group of women physically assualt some army personnel stationed in Jumla for diverting water into the camp. The soldiers were greatly shaken.

Dating

Local panchayat members were not able to produce any documents but were

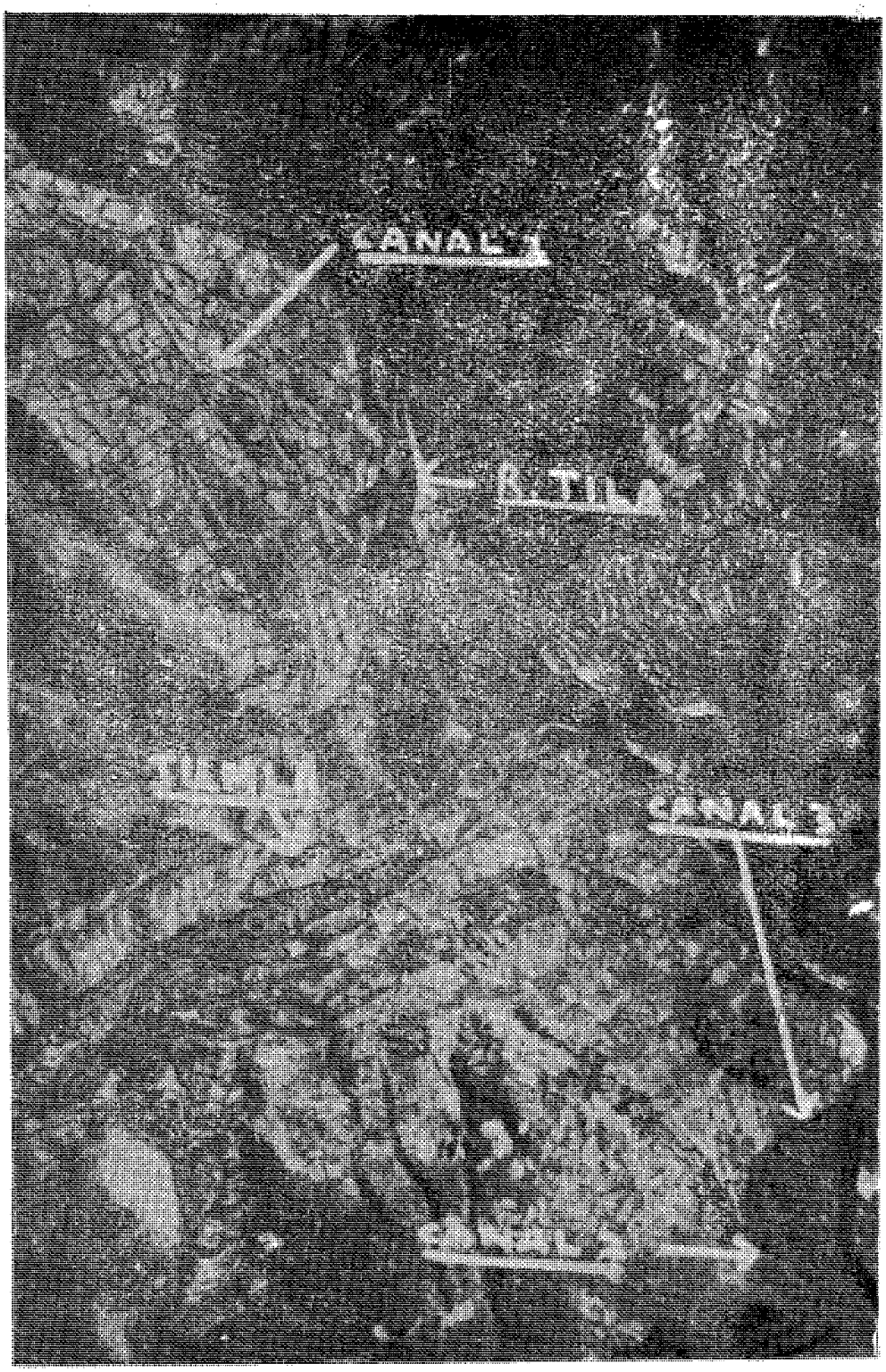

Photo No.3- Aerial photo of Jumla Canals

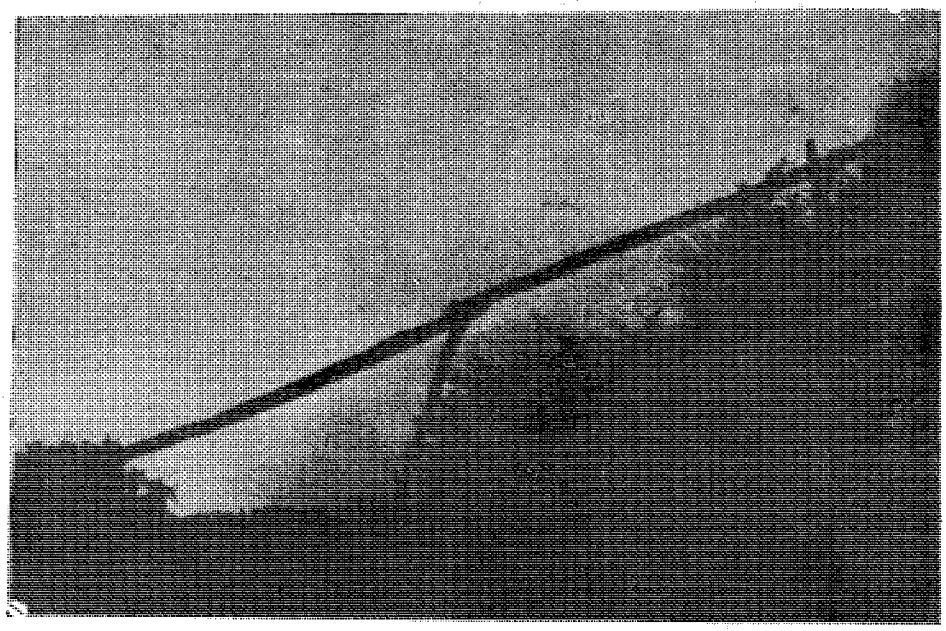

Plate No. 4 – Aquaduct using branch logs

Plate No. 5 – Storing stones in gaps in large boulders

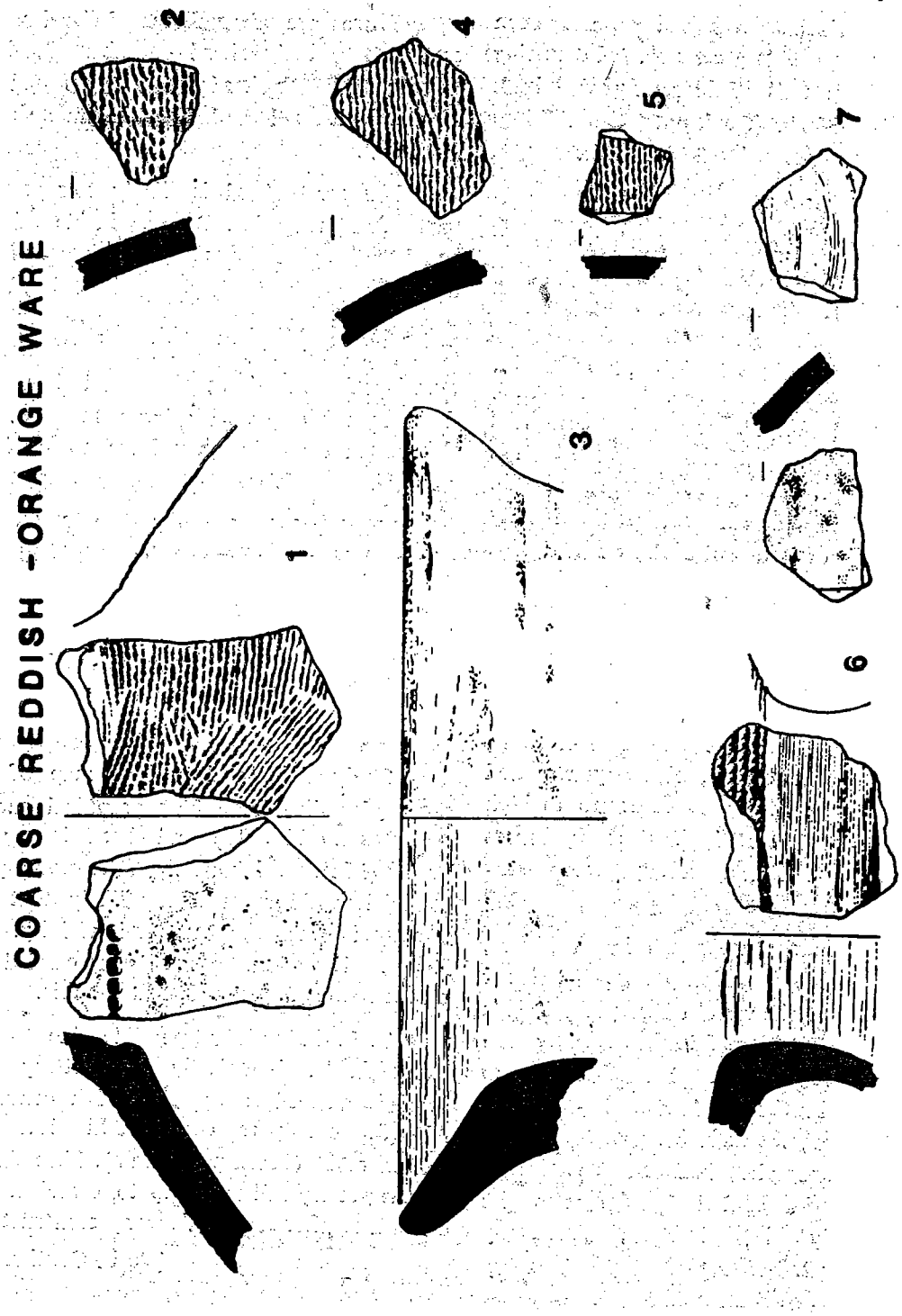

FIG 3

able to reveal that they had certainly been in use through this century. Interesting local tradition tells of the canals being built by a 'great Mulla hero', but the folklore tale gives no more detail than this.

Pottery

I located a number of sherds in an exposed outer bank section of canal number 1, see Fig. 4. The sherds were well stratified in a two metre section, their depths were as follows: No. 1-0.57, No. 2-0.65, No, 3-0.74, No. 4-0.93, No. 5-1.07, No. 6-1.38, No. 7-1.42. The section was continuous and did not show any horizons. These sherds are the first to be recorded from the Jumla vicinity. The sherd colour is predominantly light-reddish-orange on both external and internal surfaces. The external and internal margin is commonly light grey in colour. The pottery is hard, its feel is slightly rough. The feature is finely irregular between the inclusions. Using a hand lens I was able to identify three common inclusions, grey transparent quartz, clear quartz and mica. Their frequency was moderate to high and they were ill sorted, the size ranged from medium to fine. The rounding was sub-angular.

Wheel marks are much in evidence, this suggests the use of a potters wheel for manufacture of the vessels. Two plain designs are show in numbers 3 to 6, the others are corded. Some of the corded designs are irregular as in the case of number 1 and 7, others appears to have a more regular design, for example, number 6. The size of the cord used in making the design varies from relatively thin, number 1, to relatively thick, number 2.

There are four forms of sherd represented. One, body sherd – numbers 2, 4, 5 and 7; two neck sherds, two types can be seen, numbers 1 and 6, one rim sherd, number 3.

Number 1 sherd is likely to represent part of a storage jar. On the inside of this sherd there are a series of teeth-like marks, these peter out as they go clockwise, they may have continued in an anti--clockwise direction. There are also faint discontinuous markings further down the sherd, here the designer may have been trying out the marks. Other than decorative they have no obvious purpose.

Number 6 sherd may be part of the top of a container, its shape at the neck is almost identical to wooden vessel forms used in the area for carrying curd.

Number 3 sherd may originally have been part of a drinking vessel (Lekha, 1968, 201).

Study of the local geology map of the area (Canadian Land Topographical survey geology map No. 12) and discussions with British Museum laboratory (Freestone pers comm) it would seem highly likely that the pottery is from the Tatopani vicinity. As I write this section, tests are being carried out on the pottery to try and establish this.

T. L. dating is not possible due to the lack of funds. Stylistically the pottery has been given two date ranges 2nd-5th centuries AD (Sharma pers comm) and 10th–14th centuries AD (Knox pers comm). Firm dating of the pottery will only help to establish the date on or after the canals were constructed.

(To be Continued)