

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

(Continued)

-Thomas M. C. Pinhorn

Chapter 2: Tools of Irrigation Agriculture

Introduction

I found a large range of tools used in farming operations in the mid-western region. The tools were made out of sal in the sub-tropical regions and blue pine in the temperate-Alpine regions. Their scale is indicated in the plates. The tools can be divided into tools used in the cultivation process and used in processing the crops.

Cultivation Tools

Heavy Plough- the tool is shown at work in plate 6. The blade of the plough is often tipped with steel. The function of the tool is to break up the soil. I observed the men who

pulled the plough with water buffalo jumping into the shaft of the plough to give extra weight to its down cutting.

Large Rake- the tendrils of the rake are shown in Plate 7. This tool is attached to the water buffalo by a cross harness. The rake is used to give the clods of earth a 'fine' cut.

Small Rake- this is a particularly odd tool and to my knowledge previously unrecorded. Its distribution was restricted in area to the upper tila, I found only 4 examples. The tool is pictured in Plate 8. The tendrils show evidence of burning into shape, unlike the large rake which was cut. The use of the tool is especially designed for Beri land. The tool is used in the kneeling or crouching position. The rake is drawn from the top of the terrace downwards. The terrace is commonly a vegetable plot.

Flatboard- the flatboard is shown in Plate-



Plate No. 6- Heavy Plough at work

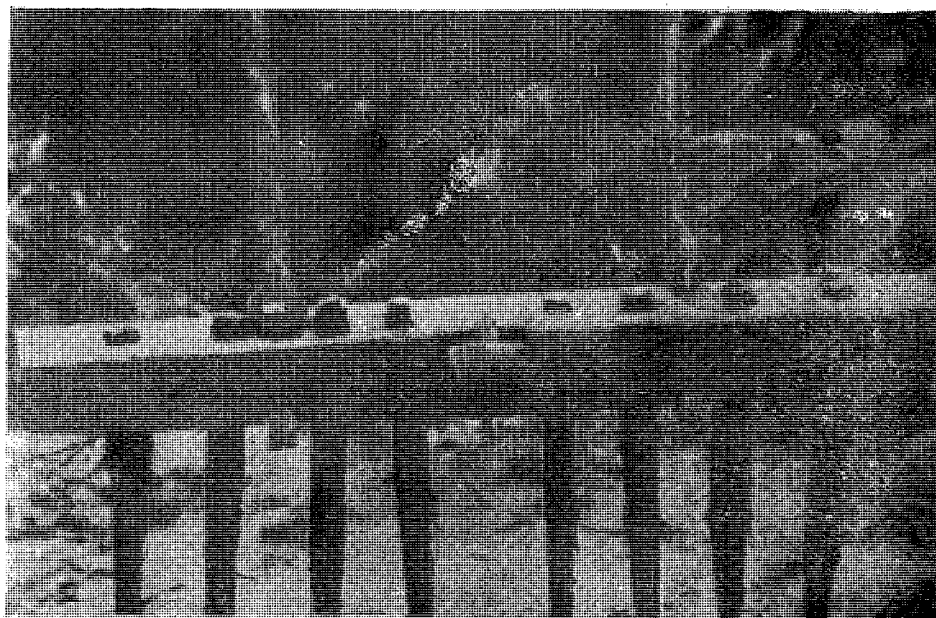


Plate No. 7- Rake



Plate No. 8- Small rake

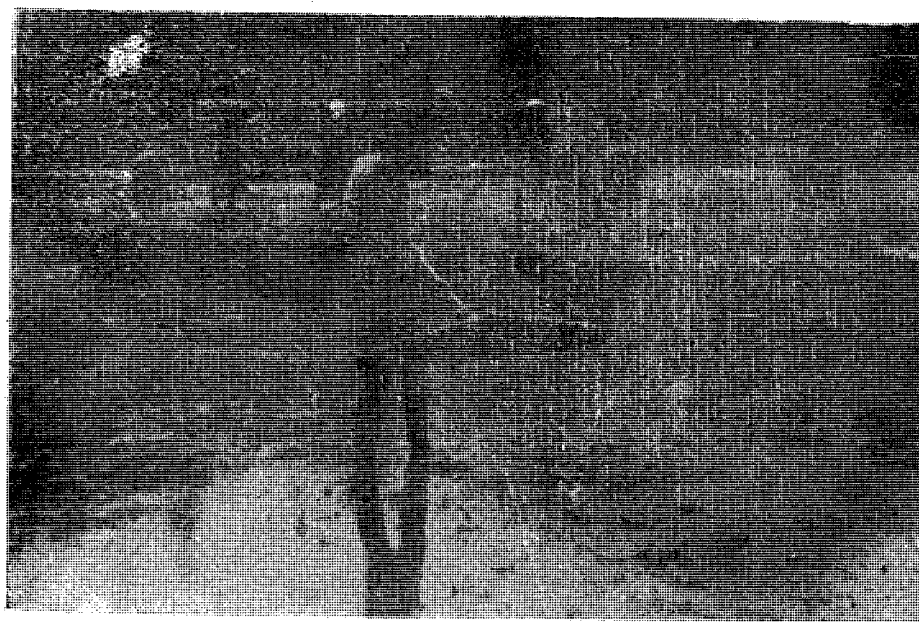


Plate No. 9- Flatboard

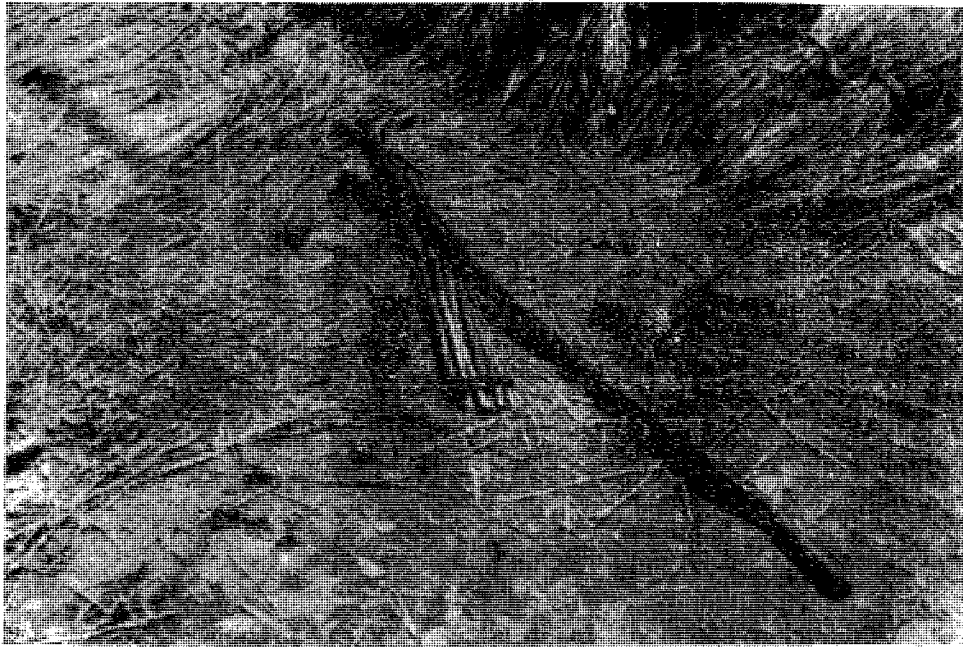


Plate No. 10- Flail and common hand beater



Plate No. 11- Modern hand grinding mill

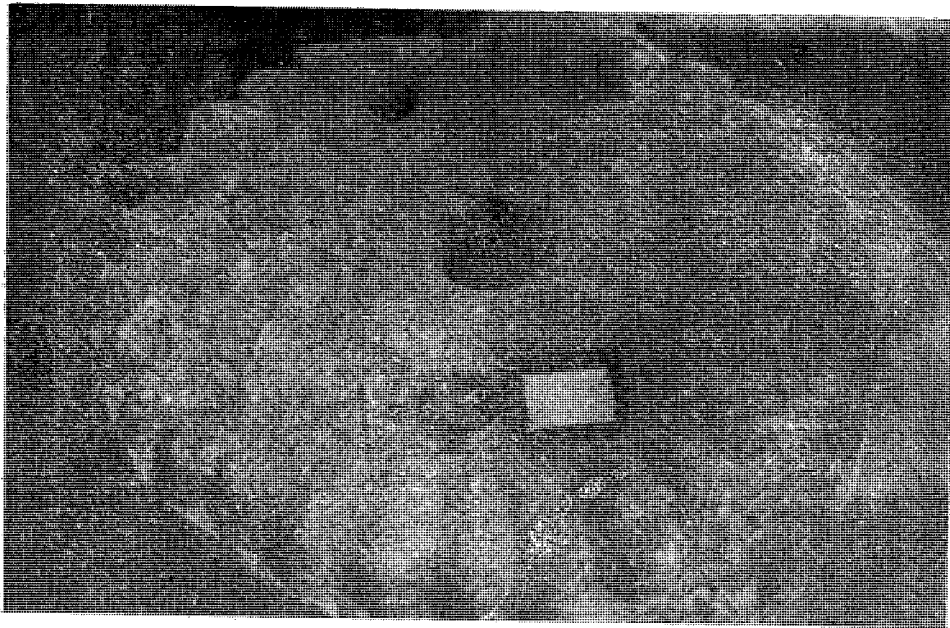


Plate No. 12- Amalaka|Ancient hand mill

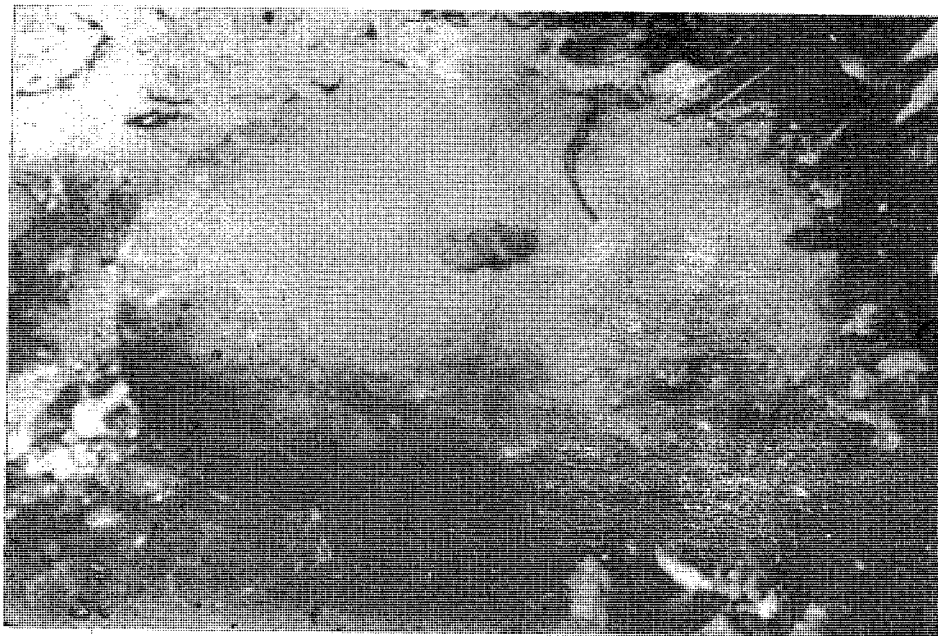


Plate No. 13- Ancient mill wheel



Plate No. 14- Women transplanting paddy

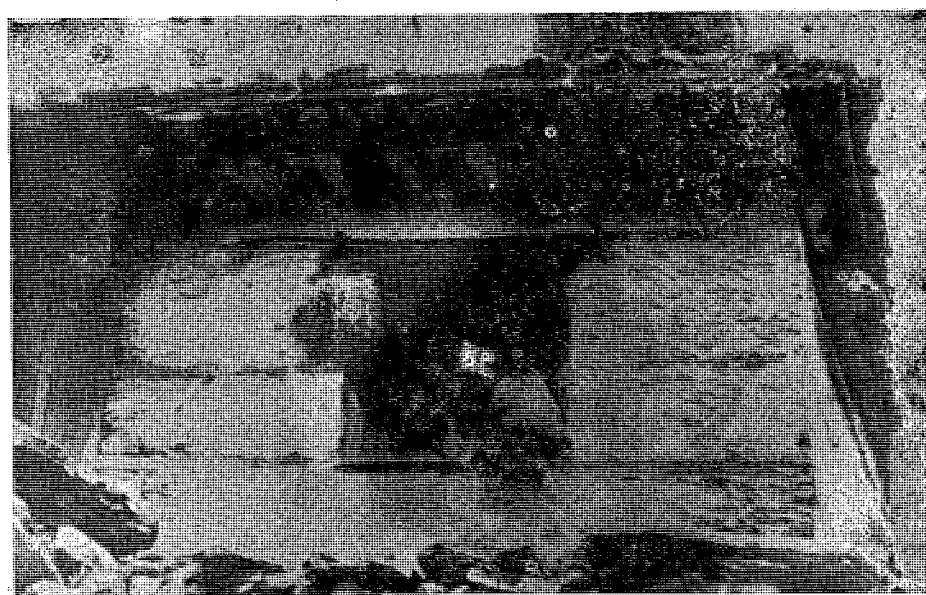


Plate No. 15- Bixh drying outside of Brahmin house, Jum'la

9, it is specifically used to flatten out the paddy terrace after the raking is done.

Processing Tools

Fodder Knife— the knife is made out of steel imported into the region from India, via Nepalganj. The steel is beaten into a hook shape by local blacksmiths. The handle is made out of a soft wood known as Bhojatva. The knife is used for cutting grasses of all kinds.

Flail— the flail is shown in Plate 10, I only saw the flail in the temperate-Alpine regions though it must exist also on the Terai. The flail is attached to the pole by a loose socket joint. This allows the flail to be turned in the short flicking motion associated with threshing. Often associated with the flail is the common hand beater, see Plate 10. The tools are used by boys and women. In the Jumla district threshing usually took place upon the flat earthen roofs. The operation required two people, one to use the flail and the other to push the wheat/barley into a pile. The hay is tied in bundles and left to dry around the edge of the roof.

Hand Grinding Mill— a modern hand mill is shown in Plate 11. The stone is limestone, this one has been imported from India. It takes one person to operate, the grains are poured through the funnel at the top and the flour collected at the sides. I observed local village children making smaller replicas mills as toys.

Amalaka/Ancient Hand Mill— an interesting discovery I made from the region was a carved stone shown in plate 12, see Fig. No. 1. The primary use was as an ornamental/religious symbol (Sharma, 1972, 24), on top of a Buddhist stupa (Sharma, 1972, 27), perhaps

originally at Michagon, since the stupas are in a ruinous state here. Alternatively it comes from the grander temple at Ukhadi (Sharma, 1972, 23), forming the second or third stage in the umbrella pyramid.

The secondary hole in the top of the stone shows that it has had attempted, because the stone limestone greywacke (Greene pers. comm) would certainly have accompanied the foodstuffs being ground up. Perhaps this is why the stone does not have much grinding wear underneath it.

Dating of primary use is either in the Malla period or comes within the Baisi period 1485-1501 AD (Sharma, 1972, 19). Dating of the secondary use is problematic, it was placed in its present position some twelve years ago on top of a modern waterpoint. The secondary use likely dates some time in the late Baisi or Gorkha periods (Sharma, 1972, 20).

Mill Wheel— the discovery of this wheel was the single most important find I made. It is located three-quarters of an hour before Dailekh above a waterpoint, see Fig. No. 2. This is the first wheel of its type to be recorded in Nepal. The wheel functioned as a grinding mill wheel for a gutter. The mill wheel is shown in Plate 14. The system it was part of is almost certainly the Norse Mill type, indeed this type can still be seen throughout the region. The type is illustrated in Fig. 5. In contrast to some view held on the system (Water Technology) the mills in the region do grinding for communities not just families. It is possible that originally the mill stood where now the waterpoint exists.

Dating can be done stylistically. The 'petal' design is the same short-lived style as on the basement of Latikoili (Sharma, 1972,

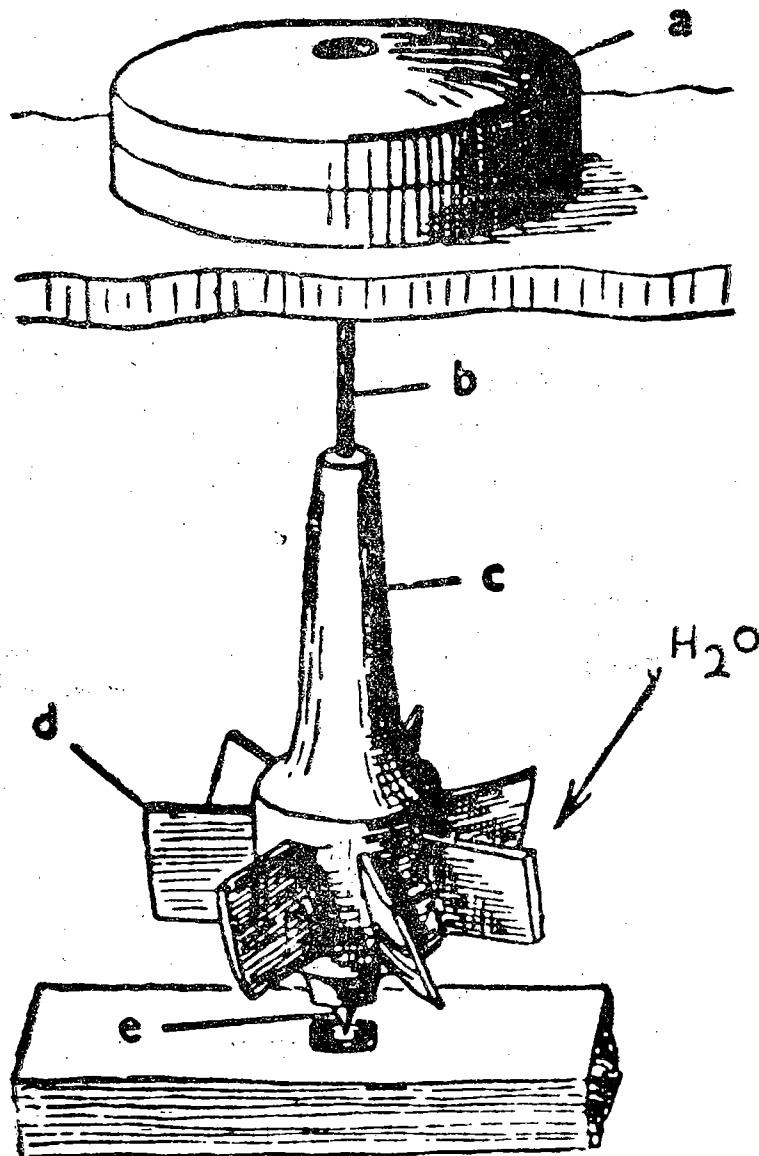
NORSE MILL

Fig. 4

KEY

- a - mill stones
- b - axle
- c - axle bore
- d - paddles
- e - stone block

26), which can be closely dated to 1582 AD. Thus the mill stone firmly dates from the Baisi period.

Chapter 3: The Crops of Irrigation Agriculture

Case Study Salkot

Introduction

Agriculture is the principal economic activity of the people of the Salkot area which provides them with food, clothes and shelter. Most farmers use local seeds for the different crops they grow. Almost all the paddy in the Salkot area is transplanted. Maize and wheat are usually broadcast. Little or no weeding is done. The women usually do the transplanting, see Plate 15. The paddy is traditionally tied by a reef knot, see Plate 15. Farmers use a substantial amount of farmyard

manure and compost as fertilizers. The application of inorganic fertilizer is quite negligible.

Existing Crop Pattern

Farmers in the Salkot area cultivate 770 hectares of land (290 of Khet land, 480 of Pakho land). Generally two crops are grown a year, both in Khet and Pakho, except in some Pakho where only one crop is grown. The major crop rotation is paddy in the monsoon (3 crops of red rice, 4 crops of white) season which is followed by wheat, maize, black grain, oil seeds or pulses in the winter. A small portion of the land is also covered with pea, sugarcane and vegetables. Early paddy is not grown. In the Salkot area 20 ropanis are equivalent to a hectare and 13.5 ropanis to a bigha.

Results

The results of my survey of the area are contained in Tables 1, 2, 3 and 4.

TABLE NO. 1
Area Under Different Cereals Crops

Crops	Area in hectares (Khet & Pakho)	Area in % out of total Cultivated Land
Paddy	280	36%
Wheat	350	45%
Maize	400	52%
Millet	50	6.5%
Mustard & others	225	29%

Total cropped area: 1305 ha.

Total cultivated land: 770 ha. Cropping intensity: 168.5%

Paddy is grown in almost all Khetland in the monsoon season except in swampy areas.

TABLE NO. 2
Existing Cropping Patterns

Type of Crop	No. of Crops	Crops	Planting Time	Harvesting Time	Remarks
Khet	2	Paddy Wheat	June-July Nov.-Dec.	Oct.-Nov. March-April	Major cropping pattern.
Khet	2	Paddy Gram or Lentil	June-July Nov.-Dec.	Oct.-Nov. March-April	Minor cropping pattern.
Pakho	2	Maize Millet	June-July (1st week) July-Aug.	Aug.-Sept. Sept.-Oct.	Major cropping pattern.
Pakho	1	Maize Fallow	June-July (1st week)	Aug.-Sept.	Major cropping pattern.
Pakho	2	Maize Wheat	June-July (1st week) Nov.-Dec.	Aug.-Sept. March-April	Minor cropping pattern.
Pakho	2	Maize Black-gram	June-July (1st week) July-Aug.	Aug.-Sept. Nov.-Dec.	Minor cropping pattern.
Pakho	2	Wheat Millet	Nov.-Dec. June	March-April Sept.-Oct.	Minor cropping pattern.

Other minor crops and vegetables grown in the project area are peas, barley, cowpeas, potato, ladies's fingers, brinjal, radish, pumpkin, cucumber, chili, etc.

Existing cropping intensity: (Case study of some farmers)

Rc

Pa

Pa

M:

M:

M:

TABLE NO. 3
 Area in Hectares, Total Cultivated Land and Cropping Intensity
 (Based on interviews with the farmers)

Crops	Farmer No. 1 Area (ha)	Farmer No. 2 Area (ha)	Farmer No. 3 Area (h)	Remarks
Paddy	0.7	0.5	0.45	
Wheat	0.95	0.7	0.6	Both for Khet & Pakho land
Maize	1.15	1.0	0.65	
Mustard	0.25	0.25	0.075	
Millet	0.15	0.1	0.05	
Others	0.3	0.2	0.075	
Total cropped area	3.5	2.75	1.9	
Cropping intensity	175%	183%	190%	

TABLE NO. 4
 Average Cropping Intensity According to Crop Rotations

Rotations	Land Type	Cultivated Area (ha)	Paddy	Wheat	Maize	Lentil	Millet	Other	Fallow	Cropped Area (ha)	Cropping Intensity
Paddy-Wheat	Khet	0.75	0.75	0.65	—	—	—	—	—	1.4	186.66
Paddy-Lentil	Khet	0.75	0.75	—	—	0.35	—	—	—	1.1	146.66
Maize-Millet	Pakho	1.0	—	—	1.0	—	0.5	—	—	1.5	150.00
Millet	Pakho	1.0	—	1.0	—	—	0.75	—	—	1.75	175.00
Maize-Fallow	Pakho	1.0	—	—	1.0	—	—	—	—	1.0	100%

Case study of the Jumla district

Introduction

Agriculture like the Salkot area is the principal economic activity, there is still a considerable amount of trading which supplements the crops. Local seeds are used again and the fertilizer is a mixture of cow dung and green leaves, no inorganic fertilizers are used. The fertilizer like at Salkot is ploughed into the ground. Paddy is transplanted from the seed beds to the rest of the field normally by the women. Weeding is done in the area unlike at Salkot.

Existing crop pattern

The farmers in the Jumla district (upper tila area) irrigate approximately 530 hectares of Khet and 330 hectares of Pakho. In Pakho land only one crop a year is grown, otherwise similar arrangements exist as at Salkot. Beans, blackgram and potatoes are more abundant; as well as wah. Early paddy is impossible to grow here. Paddy cultivation has been recorded at heights of 9,000 ft and in fact is the highest paddy cultivation in the world. Interestingly the rice which is red (unique to mid-western Nepal) becomes redder as it is grown at higher altitudes. The climate is such that only one crop of rice is possible.

The area suffers from food shortage and the government drops in rice in the winter. Interestingly the Brahmin caste which dominate the area prefer white to red rice, even though red rice is more nutritious and has a rather 'meaty' taste. This may be as a result of the government workers in the area who receive white rice, the workers are accorded high status and many are also Brahmins. One v. s. o. worker said to me "the Brahmins would rather starve than eat millet". This is very true, certainly

millet and potatoes could grow well here. However, they refuse to irrigate their potato fields, preferring to irrigate paddy. As a result the potatoes are small. There is also a reluctance by some of the community to eat potatoes since they believe it gives them hydroceles.

Results

The Table No. 5 shows the crop calendar of the upper tila area of the Jumla district.

Cash Crops

Apples are the most important cash crop of Jumla. They have no need of drainage as do the trees of the Salkot area. The orchards are laid out on the Pakho land in neat rows, usually in sheltered topography. I met many porters carrying apples and skins from Jumla and exporting them down the trail.

Trading

The trading of horses from Jumla was formerly of great importance (Tucci, 1956, 39). I saw no horses in the Jumla district and local officials told me that there was virtually no trade in them in the district. The trade in them now came from Mugu to the north. Agriculture is greatly helped by the export from the region of wood, herbs, ghee and salt from Tibet. This provides cash to maintain the canal system and also supplements the livelihood of many of the farmers who would otherwise be unable to buy luxuries such as sugar.

Case study of herbs from Jumla

For two weeks of my stay in Jumla I carried out work in local herbs, set out below are notes of vegetables from wild resources, edible oil from seeds of wild plants with miscellaneous uses and wild plants as a cash commodity with established markets.

TABLE NO. 5

M. 2200-2700 Ft. 7500-9000		M A M J J A S O N D J F M A M												
NOT IRR.	JUMLA		FAGOPTRUM BARLEY.....and.....WHEAT BARLEY.....and.....WHEAT AGITAN MILLET P O T A T O FAGOPTRUM BARLEY...and...WAH											
	M. 1500-2200 Ft. 4900-7500													
IRR.	Jewla Jawad Chad, Khet		PADDY BARLEY PADDY PADDY											
	NOT IRR.	Ghaderi Bhuwa		BEANS BARLEY...and...WAH FAG TARTARICUM F. ESCULENTUM PANICUM.....and... ..AMARANTHUS SETAVIAand... ..AMARANTHUS										

Vegetables from Wild Resources

Plant	Nepali Name	Part used
Allium Pratii	Ban Labun	Leaves & bulbs
Arisaema utile	Dhokayo	Leaves
Arundinaria sps.	Nigalo tusa	Young shoots
Asparagus recemosus	Kurilo	Young shoots & tubers
Caragana brevispina	Saga	Flower buds
Chenopodium album	Saga	Leaves
Phragmites sp.	Saga	Stem base
Meconopsis sps.	Saga	Roots
Megacarpaea polyandra	Ruli	Leaves
Phytolaca acinosa	Jaringo	Leaves
Smilacina oleracea	Saga	Leaves
Urtica dioica	Sisnu	Leaves

Edible Oils from Seeds of Wild Plants

Cannabis sativa	Bhango
Olea cuspidata	Saga
Prinsepia utilis	Datelo/Dhuntel
Symplocos sps.	Kaulo
<i>Abies spectabilis</i> (Thingo)- female cones yield a deep blue dye used for ink.	
<i>Arundinana sps.</i> (Nigalo)- a versatile material for making baskets, containers for corn, screens, mats, etc. -used to make pens, also pipes for smoking tobacco.	
<i>Betula utilis</i> (Bhojpatra)- bark used as a water-proofing on roofs, as a protective layer in storage pits, as a wrapping material for butter, etc. - branches used to make handles of tools and cooking utensils,	
<i>Boehmeria plalyphylla</i> (Dav)- used to make high quality pots and small containers.	

Cannabis sativa (Bhango) - stem/fibre used of making clothes, socks and shoes.

Daphne papyracea (Kagaji) - bark fibre used for making paper, ropes, string.

Pinus wallichiana (Jumlit Sallo) - resin used variously to stop leaks in pots, also used as a protective against cracking of skin in cold weather. Resinous wood used as burning sticks and lamps. Leaves extensively used to prepare manure.

Populus cilcata (Pipal) -- a plant used in various religious ceremonies as a substitute for the true 'pipal'; ficus religiosa.

Rhododendron cordifolia (Majitho) -- roots yield a dye for coloured clothes, etc.

Xanthoxylum amatum (Timur) - fruits used as a condiment.

Wild Plants used as a cash commodity with established markets

Aconitum sps. (Bikh) see Plate 15.

Cordyceps sinensis (Yerchagombu)

Nardostachys jatamansi (Jatamansi)

Orchis stracheyi (Hatta Jadi)

Paris polyphylla (Sutueva)

Picrochya scrophulariaefolia (Kutki)

Rheum sps. (Padamchal)

Rubia cordifolia (Majitho)

Swertia species (Chiraito)

Valeriana wallichiana (Sugandawal)

(To be continued)