Chapter - IV

THE NEOLITHIC ECONOMY

Field Agriculture

It is a universally accepted reality that pre-historic man was in essence a food gatherer who in the Neolithic period became conversant with the art of farming to adopt it as a permanent means of livelihood. Such an observation is by and large applicable to Kashmir also. The remains of agricultural implements, food processing equipment together with the evidence of seeds of many types of food plants found from the excavated sites of Burzahom and Gofkral finally establish that the Neolithic man of 3000-1000 B.C. in Kashmir had adopted farming for his sustenance. Nevertheless he did not altogether disengage himself from the age-old mode of production i.e. hunting, particularly during the early days of the Neolithic culture, as a subsidiary means of sustenance. However, his tendency to transform himself from a food-gatherer to a settled farmer must have been a result of circumstantial exigency. Since it has been always in the nature of mankind to look around for all that is relatively comfortable and convenient, his existence in Kashmir at a time when in his neighbourhood many people had picked up farming as the main source of
Neolithic Economy

economy, Neolithic man in Kashmir too, must have not remained behind. The archaeological evidence sufficiently proves that the Neolithic man in Kashmir did not stay back as he cultivated many types of food plants, and that too of advanced types, that were essential for his sustenance and economic growth.

The archaeobotanical investigations carried on the plant remains collected at Burzahom and Gofkral reveal that there were marked similarities in the pattern of plant cultivation at these two sites; meaning thereby that during the Neolithic period in Kashmir there was homogeneity in the crop pattern. The collected material from different periods of the sites is described below.¹

During the earliest period at Burzahom (period I) cereals, pulses and horticultural crops constituted 86% of plant economy while there were also 14% of weeds. Of the food plants cereals constituted 73.68%; of which wheat (Triticum aestivum and Triticum sphaerococcum) was the major crop constituting 78.5% and the rest of 21.5% was barley (Hordeum vulgare). The share of pulses in the total agriculture was 1.9% made up by lentil

¹ G. M. Buth and R. N. Kaw, 'Plant husbandry in Neolithic Burzahom, Kashmir', *Climate and Geology of Kashmir and Central Asia, The last 4 million years*, New Delhi, 1985, pp. 109-13; Farooq A. Lone, Maqsooda Khan and G. M. Buth, *Palaeoethnobotany, Plants and Ancient Man in Kashmir*, New Delhi, 1993, pp. 204-207; Gofkral plants were studied by M. D. Kajale of Decan College, Pune and are reported in *Indian Archaeology – A Review (IAR)*, 1981-82, pp. 19-25; wherein the rice and millet were said to have been introduced in period II, but subsequently these were reported to have got introduced in period IC, A. K. Sharma, 'Excavations at Gofkral – 1981', *Puratattva*, No. 11 (1979-80), 1982; A. K. Sharma, 'Excavations at Gofkral-1982', *IAS and ISPQS Conference*, November 25-27, New Delhi, 1982.
In the 10.5% of horticultural crop, peach (*Prunus persica*) was 33.3%, apricot (*Prunus armenica*) 16.6% and walnut (*Juglans regia*) 50%. The associated weeds were *Medicago* spp, *Vicia* spp., *Galicum aparine*, *Astragalus* spp. and *Ipomea* spp.

During the middle stages (period II) the share of food plants was 89.3% and that of weeds 10.7%. Cereals constituted 67.8% (both types of wheat 73.68% and barley 26.32%), lentil 1.7% and horticultural plants 19.6% wherein new addition was almond (*Prunus amygdalus*), and peach, apricot, walnut and almond comprising respectively, 39.5%, 21%, 39.5% and 9%. Also grape (*Vitis vinifera*) was found during this period. The associated weeds were *Mililotous albus*, *Galium tricorne*, *Lithospermum arvense* and *Ipomoea* spp.

At the final stage (period III) the agricultural economy shows continuation of earlier patterns, food plants constitute 82.8% and weed ratio was 17.2%. Three new entrants in their food menu were rice, pea and cherry. Cereals constituted 62.8% (wheat 65.9%, barley 25% and rice (*Oryza sativa*) 9.1%). Pulses showed an increase reaching upto 7.2% and belonged to lentil and pea (*Pisum sativum*). Horticulture crops were to the extent of 12.8% comprising peach (68.8%), walnut (15.7%) and cherry (*Prunus domestica*) 15.7%.

Similarly, at Gofkral we have almost a similar pattern. At the earliest stage (period IA) wheat (*T. aestivum*), barley (*H. vulgare*), lentil (*L. culinaris esculanta*) and weed (*Lithospermum*) were recovered. At the middle stages (period IB) common pea (*P. arvense* Linn.) and (period IC) rice (*O. sativa*) and millet (*Elevisine coronna*) were the new entrants in the already
existing agricultural farming. During the final stage (period II) all the earlier types were existing but rice was cultivated in abundance.

This evidence of crop plants provides a clear picture of the use and development of agriculture in the Neolithic Kashmir. The agricultural tools for digging and food processing tools clearly show that agricultural plants were grown in Kashmir and utilised as food. We have noted earlier (chapter I) that the environment of Kashmir during the Neolithic period was as good as it is, by and large, now, therefore, the cultivation of these food plants would not have been hampered on ecological factors. The availability of agricultural tools together with these farming plants testify to the coexistence of relationship essentially rooted in arable land. Such a relationship would have neither existed nor developed unless there was someone to explore it first and subsequently exploit it for a given suitable purpose. This may, therefore, allow us to pre-suppose that the Neolithic man managed the tools and the seeds for the sake of growing different kinds of cultivable crops on the land available around the settlement area he lived in.

Agriculture is believed to have created property and ownership\(^2\) but such forms of inferences generally escape archaeological detection, and, therefore, the question whether the right to possess arable land was communal or individual during our period of study has a hypothetical nature.

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\(^2\) Will Durant, *The Story of Civilization, Our Oriental Heritage*, Vol. I, New York, 1935, pp. 16-19. He argues that almost everywhere land was owned by the community among primitive people as hunters had no need of private property in land; but when agriculture became the settled life of man tribal property became family property.
explanation. Houses built by individuals of a family or group of village community belong normally to the occupants. Because each of these houses was provided with a hearth, it leads to assume that family possessed such houses, (details in the infra chapter) whereas house-hold articles like stone and bone implements, food processing equipment like grinders, mullers, querns, etc. or cooking and eating pots, mats, baskets, clothes ornaments, etc. might have been indispensable and treasured property of the people who made these or used them. But such a right seized to remain private when viewed in the perspective of cultivable land, particularly in the beginning of the Neolithic culture in Kashmir. The presence of conical shaped storage pits, often lined with plaster, on the periphery of settlement at Burzahom and away from the houses might actually have been communal storage pits wherefrom stored articles were taken and used as per the need of any and all families. Their peripheral placement indirectly lead us to believe that the produce and the arable land, available around the settlement, must have obviously been a joint property, held and cultivated together. That inside or near the earliest pit houses we are unable to trace any type of storage pit, our viewpoint is vindicated that the Neolithic man of 3000–2500 B.C. Kashmir had at least no tendency to violate the communal possession of arable land, which was plentifully available in and around his settlement area. Nevertheless, it is human behaviour that genealogically related groups strengthened at the expense of community and, therefore, with the passage of time family ownership might have got introduced where parents, brothers, sisters,
cousins made a claim to the land and its produce.³ The idea of individual possession of land and its produce appears to have developed towards 2500 B.C. when the Neolithic man made separate storage places adjacent to each family apartment. By this time the common storage pits were abandoned and filled up and, consequently, agricultural development might have brought a change from communal property to family property of the arable land; and accordingly the most economical unit of production became the unit of ownership.⁴ Thereafter, the entire agricultural process involved from preparing the soil, to sowing of seeds, to cultivation of plants, to protection of fields, to harvesting of crops and its subsequent appropriation must have purely assumed an individualistic character.⁵

Anyway, the Neolithic man was capable of producing a variety of crops which for their distinct nature and specific soil could be broadly classified into winter crops or rabi and summer crops or kharif. Both of these types require peculiar conditions to grow and develop as both are grown either in cold or moderate warm conditions supplemented by occasional rainfall in some cases or abundant water in others.

⁴ E. Westermarck, Origin and Development of Moral Ideas, Vol. I, London, 1917, pp. 35-42. He believes that once a man by hard labour reclaimed land from forests, jungles or marshes such land he guarded jealously as his own and in the end society recognized his right and then individual property began.
⁵ Will Durant, The Story of Civilization, p. 18. He argues that while communism flourishes most readily in times of dearth, when the common danger of starvation fuses the individual into a group, on the other hand when abundance comes, and the danger subsides, social cohesion is lessened and individualism increases.
Notwithstanding these diversification's, the Neolithic Kashmir had in the
beginning only the single cropping method as only the rabi crop cultivation
of wheat, barley and lentil was grown. Likewise, the pea cultivation is a
winter crop, requiring cool growing season, abundant rainfall and relatively
humid spring climate. The Neolithic man seems to have learnt double
cropping pattern as late as 2000 B.C. when he began to grow rice as the
major kharif crop. This kharif crop, which is the most cultivated cereal of the
Valley today, needs plenty of water, and moderate summer warmth.
Nevertheless, these rabi and kharif crops were indeed supplemented by
horticultural produce of peach, apricot, walnut and almond. Their
exploitation thus made available to the Neolithic man a mixed cropping
pattern to supplicate the food supplies both in summer and winter as these
could also be used as dried fruits.

No evidence is available as could suggest that the arable land of the
Neolithic farmer was located within the village extent which were located
invariably on a Karewa top. As these villages are situated at a height of
about 35 meters from the fields below\(^5\) procurement of water for irrigation
at such heights must have been a stupendous task for a man not
conversant with modern techniques of irrigation, even though their rabi
crops would have required very little water. The presence of water source
below the Karewa heights must, therefore, suggest that the cultivable land

\(^5\) Like the site of Gofkral, *IAR*, 1981-82, p. 19. Similarly the Neolithic sites in
Kashmir are located on high lands and are surrounded by rice fields located
at low levels drawing their irrigation on the principle of gravity as these fields
have a descending physiography while the water sources are placed at
higher levels.
of the Neolithic man must have been situated on the plain land down the mound where water of a lake or else a mountain stream was readily available for the purpose. The landscape of the Valley and the location of water sources at higher levels would have fulfilled the requirement of the Neolithic man to utilize these fields for agriculture. Nevertheless, the present experience shows that crops like wheat, barley and pulses do fairly well on winter precipitation alone and even in absence of irrigation system. The winter precipitation comprising abundant snowfall and incessant rains would have minimized the quantum of required input labour for digging the agricultural fields even though their digging equipment was primarily primitive. In this entire process of digging, the soil was dug with the help of several digging tools which as a matter of coincidence had a multipurpose utility. The farmers were, therefore, required to break up the soil, the top of which was composed of loess which as a matter of fact is rather loose soil, with hoes, celts, picks and wooden digging sticks mounted with mace heads. But once the ploughing became known to them, as the archaeological detection points to the presence of plough as an agricultural tool at some stage of their farming at Turkepur for which there was no dearth of animals required for driving it, the digging process might have become still easier. All these tools would have made it possible to sow seeds soon after sods were turned over, without any further labour. The seeds thus buried in the soil would germinate on account of rainfall or irrigation. As for the cultivation of rice, continuous stay of water in the fields was necessary, irrigation was, therefore, inevitable. In this context, the geographical setting of their fields was ideal as these could get irrigated.
because of descending landscape, as now, from a water source which usually was at a higher place. However, for the cultivation of rice, besides this essential requirement, fields were to be sufficiently prepared and as such to be opened up, as now, by hoeing and ploughing before and after irrigating them. For such a preparation the Neolithic man had only hoes and primitive ploughs that would open up the land but not sufficiently deep. For that reason, low land might have been preferred, near a lake shore or marshy land which could remain water logged for a considerable period of time annually. These fields might have been hoed followed by puddling and the farmers could accomplish this, as now, by splashing around with bare feet. In such a situation they could do without transplanting young rice saplings from nursery beds to rice fields for which the soil needed to be extra soft. In the puddled –flooded field seeds might have been simply broadcast for the direct cultivation of rice plants to involve less labour input, as is being done at present on the marshy lands in the Valley.

Whatever the nature of soil, it remains a reality, as now that any kind of soil before or after sowing a crop required energy enrichment for which Neolithic man might have used animal dung as manure. It may be mentioned here that he had a large number of domesticated animals to

Transplantation in the rice cultivation contributes much to the increase in yield, and lack of this is possibly the reason that rice cultivation percentage was found very low as compared to wheat and barley, which remained the principal crops then. However, this ratio changed in the post-Neolithic periods, possibly because of transplantation of rice saplings, as is evident from Semthan finds where around 1000 B.C. rice constituted 55.8%, wheat 30.8% and barley 14.4% of total crops, even though this ratio in favour of rice does not remain constant subsequently, yet it finally became the major crop of Kashmir, Farooq A. Lone, *et al*, *Palaeoethnobotany*, pp. 207-12.
help him in this endeavour. As our sites of Burzahom and Gofkral show these villages were inhabited continuously, generation after generation without any break, the upland soils were thus utilized without being renewed by flood soils. Nevertheless, in their crop lands some of legume family plants, like pulses and clovers, were also growing. Such legumes are well known for their utility in fixing nitrogen (from atmosphere) in the soil which in turn supplements fertility of land under cultivation. So far as the Neolithic peasant is concerned, once these qualities of legumes became known to him he might have adopted rotation of crops in order to maintain soil fertility and reduce possibility of soil exhaustion. However, given the abundance of land around their habitations, there was even possibility of desertions of the exhausted crop fields and, as a substitute, the Neolithic man must have claimed the forest land though this should not have been the only consideration for this act. The palynological studies carried out by Vishnu Mittre at Haigam lake of the Valley has revealed that Kashmir forests were cleared for agricultural purposes around 2000 B.C., causing thereby decline of pine forests, followed by appearance of Plantago lancelate, rise in chenopodiaceae and composite shrubs, while all these developments were due to promote and speed up the ongoing agricultural activity of herbaceous plant growth, they were simultaneously bound to stimulate a reasonable balance in the land-man ratio which on account of

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8 Clover is a legume weed plant and was reported alongwith cereals from Gofkral, A. K. Sharma, IAS and ISPQS, 1982.
population explosion must otherwise have got imbalanced. In fact Gorden Childe has maintained that because of development of agricultural activity the Neolithic period experienced rapid rise in population all over the world.\(^\text{10}\) Even, otherwise one is within one's right to suppose logically that the need to clear forests for the sake of agricultural development would not have been usually felt unless forced by the necessity of growing population.\(^\text{11}\) The reclamation of various types of cereal seeds from the excavated sites of Burzahom and Gofkral attest to active agricultural activity during the Neolithic period. Besides the palynological researches at Haigam lake, Anchar lake pollen sequence of Rekha Dodia too vindicates greater agricultural activity and also point to the cultivation of adequate cerealia type vegetation during the Neolithic times in Kashmir.\(^\text{12}\) These studies, therefore, suggest that crop agriculture had spread to various parts of Kashmir during the Neolithic times. Together with this, weed types, as found at Burzahom and Gofkral alongwith cereal types, are of great significance to agriculture. Besides playing important role in plant mutation and domestication, as in wheat, they are also indicative of high agricultural activity.\(^\text{13}\)

Whatever the qualities of weed plants in the progress of agriculture, these grow at the cost of food plants in the fields, and impair and retard the agricultural yield. Our Neolithic man seems to have been ignorant of the

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\(^{11}\) Infra Chapter, Neolithic Society.


\(^{13}\) Farooq A. Lone, *et al., Palaeoethnobotany*, pp. 149-51.
weed plants as a deterrent to the yield of food plants and because of it he did not separate the weeds from food plants in the agricultural fields. The retrieval of many types of weed remains along with crop seeds at Burzahom and Gofkral suggest that these weeds were actually harvested along with food crops. There is no indication whether or not these weeds were later on separated during the processing of the food. In any case, the Neolithic man seems to have compromised with the otherwise negative effects of weeds on the crop yield, of which we have no direct estimates. Neither do we have any idea about the conditions determining productivity per unit of land. In view of such obvious limitations we are constrained to form a hypothesis while making West Asia as a model. Crop yield per unit of land at around 2400 B.C. in southern Mesopotamia has been calculated on the basis of equipment, the type of seed grains available, the nature and salt composition of cultivable land. Accordingly it was found that each acre of irrigated land yielded 575 kgs of barley and 525 kgs of bread wheat.\(^{14}\) Similarly Chinese scholars were able to estimate that in one acre of cultivated land about 360 kgs of millet\(^{15}\) was being produced during the Yang shao times, the earliest Neolithic period in China. Since the Kashmir farmer raised the West Asian type of wheat and barley, and Chinese type

\(^{14}\) Thorkild Jacobson and Robert M. Adams, 'Salt and Silt in Ancient Mesopotamian Agriculture', Science, Vol. CXXVIII, No. 3334, Nov. 1958, pp. 1251-58. The Chicago University scholars estimated these cereals in US bushels measurements of volume and since one US bushel weighs about 48 pounds of barley and about 60 pounds of bread wheat it makes thereby about 1440 pounds of barley and 1309 pounds of bread wheat and since one pound is equal to 400 grams, the measurement of these food items is thus arrived at.

\(^{15}\) Ping -Ti Ho, The Cradle of the East, Chicago, 1973, pp. 85-86.
of millet (infra pages of this chapter), accordingly the average yield per acre in Kashmir can also be computed around 550 kgs of wheat or barley, and about 350 kgs of millet per annum; which nevertheless was subject to change depending on the conditions related to bumper crop or serious crop failure. With this average yield a Neolithic farmer must have relatively led a comfortable life assured by surplus produce sufficient enough to feed seven members of his family. This can be explained by the Chinese standards whereby an adult male was able to cultivate in a year 4.4 acres of land all alone effectively. Applying the same standard on Kashmir, a Neolithic farmer here too must have been, more or less, able to produce 2420 kgs of wheat/barley or 1540 kgs of millet per annum from a maximum of 4.4 acres of land he was able to cultivate all alone. Since one kg of most of the cereals produce 3,350 calories, 1540 kg of millet or 2420 kgs of wheat or barley will produce, 5,159,000 and 8,107,000 calories respectively. While reconciling the human requirement with the quantum of his energy consumed in the process of work, the large number of calories produced by his cereal production was comparatively adequate enough for seven family members annually, keeping in view the fact that the daily requirement is 2300 calories for an adult working male to sustain himself.

This would mean that such an individual living exclusively on cereal food

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16 The family and size of family are described in the infra chapter.
17 Ping-Ti Ho, *The Cradle of the East*, p. 84.
would require 700 gms of grains, and shall consume about 255 kgs of such a cereal per annum.\textsuperscript{20} As per the above calculations, one acre of land will support 2.1 individuals on wheat/barley (and 1.4 individuals on millet) – a figure that more or less coincide with the one worked out for the Harappans where produce of one acre could feed about 1.86 persons annually\textsuperscript{21} on wheat and barley. Accordingly if we consider that on an average two persons in Kashmir could live on wheat/barley produce of one acre, the seven family members of such a peasant were thus beneficiary and were able to retain some surplus with them (consumption, 255 × 7 = 1885 kgs; yield 2420 kg – consumption 1885 kg = surplus 535 kg). Such a hypothetical observation would have been reinforced had the remains of agricultural products been located in heaps stored at one or the other place. As such we do not have direct evidence about the surplus, technique of crop storage and that too of surplus. Nevertheless, one can infer that once the pottery articles were manufactured at our sites these might have been used for the storage of food grains even though they were not of large sizes. In this connection, most certainly, the storage pits, as described earlier, might have served their purpose. For the sake of effective preservation, these storage places had a provision for roof cover as well as

\textsuperscript{20} The amount of calories drawn from other sources of food is given in infra pages where animal food is mentioned alongwith the accurate number of calories from cereals.

were lined internally with a coat of plaster – a mechanism which was different from the Egyptians who for their storage pits had a basket lining.\textsuperscript{22}

Whatever be the quantity of agricultural produce, it was to be stored but not before the crops were processed first. Their processing techniques were non-mechanized, by and large the same as now. After harvesting\textsuperscript{23} the pods of the lentils or pulses needed to be dried to get the grains freed with human hand, but if the quantity was more, their grains get released from the pods by trampling with the hooves of animals driven on the dry heaps. Similarly, the cereal crops after their harvest and subsequent drying in sunlight, the grains were to be released through threshing, as all the cereal crops in Kashmir were of threshing crops (infra pages, this chapter) which may have been, as now, done by striking a bunch of cereal plants against a wooden log which in process led to the collection of grains on the floor, containing chaff and straw pieces as well. These non-food particles would get separated by winnowing, whereby the grains along with non-food particles contained in a small basket are allowed to drop from a height, to remove the light weight chaff and straw carried aside by the breeze and heavy grains fall down. It is significant to point out here that these people

\textsuperscript{22} J. Hawkes, \textit{History of Mankind}, p. 285, 310.

As there was no blade industry available during the Neolithic period in Kashmir, it becomes rather difficult to envisage what formed the harvesting tool. The tool that is regarded to have served effectively for the purpose is known as harvester, available in stone as well as bone, but this tool was not available from the very beginning and appears only towards the middle stages, Table II and III, and foot note no. 121, supra Chapter II; on the other hand mace-heads mounted on wooden sticks have been found to have served the purpose during harvesting, supra Chapter III.
were conversant with the art of basket making which besides other uses might have been used for this purpose also. After the net product was collected, this was to be processed in every house for the preparation of food by pounding in querns and grinding with grinders which were found in large numbers during the excavations at Burzahom.

Having this background in mind, it is in the fitness of the things to deal with the history of each crop separately so that we understand what were the possible sources for the genesis of the agriculture in Kashmir.

**Wheat.** Wheat being a rabi crop, it is sown towards the beginning of the winter and harvested towards the end of the spring season and as such grows in fairly cool conditions, abundant snowfall, and periodical rains. Because of these conditions this crop requires very little irrigation for its growth and largely receives the natural precipitation. The available palaeobotanical evidence suggests that wheat was the principal and popular crop of the Neolithic Kashmir. Its popularity can be gauged from the extent of its share in the overall cereal production which was 78.5% around 3000-2500 B.C, 73.68% around 2500-1700 B.C. and 63.7% around 1700-1000 B.C., the slight decline in its contribution towards the later phases being on account of rise in barley share and the entry of rice as a new variable in the cereal economy. Despite this barley and rice together could not take its place, with the result wheat continued to remain the principal crop.

The wheat species recovered at Burzahom and Gofkral are *Triticum aestivum* and *Triticum sphaerococcum*, both are cultivated forms of wheat.
The cultivated wheat forms are classified into three groups: diploid, tetraploid and hexaploid, based on the number of chromosomes present in each type;\(^2^4\) wherein enikorn wheat is of diploid, emmer, macaroni and rivetare of tetraploid and spelt, club wheat and bread wheat are of hexaploid group.\(^2^5\) Besides the difference in genomes, these wheats are also different in other respects presenting a heterogeneous character. The marked difference being that while as enikorn, emmer and spelt are all glume wheats in which the grains are not released by free threshing the rest of the wheat types are all naked wheats as their grains are readily released from the glume by free threshing.\(^2^6\) Of these, diploid and tetraploid wheats grew as a result of genetic interaction between wild varieties of wheats and wild grasses of the same genetic makeup.\(^2^7\) On the other hand hexaploid bread wheat species \(T.\) aestivum and \(T.\) campactum have originated because of mutational changes from tetraploid emmer, whileas the other species of hexaploid wheat, \(T.\) sphaerococcum, is said to be a derivative of \(T.\) aestivum and wild grass Aegilops.\(^2^8\)

Notwithstanding these diversification's, distribution of wild ancestors of wheat as well as distribution, ecological behaviours and genetic interaction of weed races and archaeological findings indicate that West Asia was the centre of origin and domestication of diploid and tetraploid wheat crop.

\(^{24}\) Farooq A. Lone, et al., Palaeoethnobotany, pp. 116-17.
\(^{25}\) J. Hawkes, History of Mankind, p. 272.
\(^{26}\) Ibid.
\(^{27}\) Farooq A. Lone, et al., Palaeoethnobotany, text figure 2, p. 119.
\(^{28}\) Ibid., text figure 3, p. 120.
around 7000 B.C. Later on hexaploid wheat *T. aestivum* (and also *T. campactum*) was also grown in the West Asia around 5500 B.C. As the growth of *T. aestivum* in Kashmir is recorded as late as 3000 B.C. it, in all likelihood, was received from some West Asian source, particularly because in the Indian sub-continent, as the available archaeological records suggest, this bread wheat was grown by various people only after 3000 B.C. It being so in spite of the fact that Mehargarh in Baluchistan

The archaeological findings indicate that West Asia in the arc of hilly flanks from Deh Luran plain in Iran through south east Turkey to southern Jordan (the whole area also called fertile crescent) is the centre of origin and domestication of wheat. J. R. Harlan and D. Zohary, 'Distribution of wild wheats and barley', *Science*, No. 153, 1966, p. 1074; J. R. Harlan, 'Agricultural origins: Centres and non-centres', *Science*, No. 174, 1971, pp. 468-74.


was an early wheat growing centre, established between 6000-5000 B.C. but none of these wheat types was found there.\textsuperscript{32} So far as the other hexaploid wheat, \textit{T. sphaerococcum} is concerned, this wheat is not reported from West Asia nor from Indian sub-continent at the time it was available in Kashmir. This obliges one to infer that it was neither grown under West Asian nor north-west Indian influence. In other words, this bread wheat of Kashmir is the earliest in the sub-continent.\textsuperscript{33} Given this fact and that it was grown out of \textit{T. aestivum} and \textit{Aegilops tausubi}, which grows wild in Kashmir,\textsuperscript{34} it may allow one to suppose that it might have originated in Kashmir earlier than any other centre around.\textsuperscript{35} 

\textbf{Barley:} Barley, like wheat, is another cereal that is sown with the commencement of winter and harvested towards the end of the spring season. This automatically rendered the crop dependent on winter precipitation for its growth and development. The palaeobotanical studies have shown, that it was the major cereal crop grown in Kashmir after wheat. Its share in the overall cereal economy was 21.5\% around 3000-2500 B.C., 26.32\% around 2500-2000 B.C. and 25\% around 1700-1000 B.C.


\textsuperscript{33} Supra note 31.

\textsuperscript{34} Farooq A. Lone, \textit{et al}, \textit{Palaeoethnobotany}, p.118.

\textsuperscript{35} Before its find in Kashmir it was opined that it might have originated in north west Indian sub-continent after its find there in the Harappan context, M. V. Rao, "wheat" \textit{Evolutionary Studies in World Crops: Diversity and Change in the Indian sub-continent}, Cambridge, 1974. This may still be true if however it is reported from any pre Harappan site in the area.
Barley species, *Hordeum vulgare* and its sub specie *H. vulgare* Linn var. *hexastrichum* was found from Burzahom and Gofkral respectively. These species are the cultivated varieties of barley. The cultivated barley has originated out of the wild variety of self-pollinating two row *H. spontaneum* giving rise to cultivated two row *H. disticum* and six row *H. tetrastichum* and *H. vulgare* variety *hexastrichum*. The early home of barley, as that of wheat was West Asia where it grew and developed from wild varieties around 7000 B.C. and earliest of the six row *H. vulgare* was found there around 6000 B.C. In the Indian sub continent at the Neolithic levels of Mehargarh, six row *H. vulgare* cultivation is traceable between 6000-5000 B.C. As this variety of barley is recorded in Kashmir around 3000 B.C. it can be presumed that the cultivation of *H. vulgare* must have reached here from West Asia either independently or via Mehargarh. The latter proposition nevertheless remains unreasonable particularly in view of the fact that lentil, which was cultivated in Kashmir along with wheat and barley from the beginning of the Neolithic period, has not been found in north-west India at that period of time. As such the possible source for Kashmir barley must be other than Mehargarh or alternately any other Indian sub-continent site where this variety was grown but only before 3000 B.C.

**Rice:** Rice, is presently the major *kharif* crop and is abundantly cultivated all over the Valley. The entire process of its cultivation right from sowing the
seeds down to harvesting of the crop is completed during the summer months and, as such, requires a lot of irrigation supported by planned means. Its share, as has been revealed by botanical researches, was very low in the overall cereal economy, being to the tune of 9.11% at the beginning of its introduction and was by and large no match to wheat and barley.

The rice grown in Kashmir, *Oryza sativa*, was the cultivated variety of rice. Rice has about twenty wild varieties both of diploid and tetraploid types. Of these, wild rice *O. rufipogon* Griff Syn. and *O. perennis* Moench are generally considered to be the ancestors of *O. sativa* which was mostly grown in Asia. Chronologically speaking this cultivated form of rice evolved over a broad belt that extended from the southern foothills of the Himalayas, across upper Burma, northern Thailand, and Laos, to northern Vietnam and southwest and south China. Its earliest record comes from Chinese sites dated around 5000 B.C. But in India, the archaeological records give a diversified picture of its introduction. There is no record of rice among the Harappans except from their later stages at Rangpur and Lothal where only its husk and spikelets were collected without being

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40 Farooq A. Lone, *et al.*, *Palaeoethnobotany*, p. 108, there is another variety of rice, *O. glaberrima* which is restricted to west and central Africa.


44 Ibid
identified as to whether these were wild or cultivated types. On the other hand at Koidihava, in UP it is known to be of both wild and the cultivated rice. This is regarded to be the earliest record of rice in India on the basis of two carbon dates of $5440 \pm 240$ B.C. and $4530 \pm 135$ B.C. But the carbon dates of this site are not consistent as the date from the same level is of $1440 \pm 120$ B.C. Besides, a sequence of carbon dates of the Neolithic levels of around 1500 B.C. from the nearby site of Mahagara has put the early antiquity of rice in India into a question. From another site of the Gangetic plains in Bihar, the Neolithic levels at Chirand, it is established that they had both the wild and the cultivated varieties of rice at around 1700 B.C., establishing thereby that its cultivation in India was more or less of this date, as at many other places in India it has been found either around this period of time or later. As is detectable from the archaeological record from Gofkral (period IC and II) and later on from Burzahom (period III), the crop was raised in Kashmir between 2000-1700 B.C. The fact that this date is consistent with other Indian rice cultivation

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47 *Ibid*.


sites suggests an outside origin for the Kashmir rice. The source of its introduction in Kashmir seems to be south east Chinese sites of the Lung shan Neolithic period, for two obvious reasons; one that the two specific wild varieties of cultivated rice, as described above, were largely distributed in East Asia including China, and secondly at this period of time the Neolithic people of Kashmir seem to have made a cultural contact with Lung shan people in China.\(^{50}\) Hence the Neolithic farmer of Kashmir seems to have been largely inspired to grow rice under the Chinese influence.

*Millet:* Like rice, millet is a cultivable crop sown in the months of summer season in Kashmir. The instance of its cultivation is recorded from Gofkral along with rice around 2000 B.C., and has been identified as *Elevisine coraconna* which is a cultivated millet. The *Elevisine* or ragi or finger millet is a tropical plant and its centre of origin is Africa and came to be grown in India first during the Neolithic period.\(^{51}\) Being a tropical plant it is doubtful if finger millet was grown in Kashmir during the Neolithic period, hence its

\(^{50}\) Many aspects of Chinese influences have been enumerated by various scholars which are described in the last chapter of this work, but the most important of these is the tool called harvester which has been found at many Neolithic sites of the Yang shao and the Lung shan in China and significantly appears in Kashmir for the first time around 2000 B.C. at Gofkral (period 1C Gofkral, *IAR, 1981-82*) and even though it is reported from Burzahom period II (2500 B.C. – 1700 B.C.) yet out of total of 56 stone harvesters only two are reported from this period (supra Chapter II, table 3) making it certain that it was introduced very late in Kashmir and the possible source were the Lung shan culture people who were having this implement then.

presence at Gofkral is perceived to be a mistaken identification\textsuperscript{52} of some other type of millet crop, like *Panicum* and *Setaria* which are still available in Kashmir and were reported for the first time during the early historical period at Semthan.\textsuperscript{53} Both of these millets have originated and grown in China, in the yellow river valley during the Neolithic times.\textsuperscript{54} Because of these facts it gives an impression that either one or both of these two types of millets were raised in Kashmir during the Neolithic times under the Chinese influence as was the case with rice.

*Pulses:* Two types of pulses are known from the Neolithic levels of Kashmir. These are lentil (*masur*) and pea. Lentil first grown in Kashmir, at the beginning of the Neolithic period, is *Lens culinaris* (at Burzahom) and *Lens esculenta* Moonch (Gofkral). Both these cultivated varieties of lentils have stemmed from the wild *Lens nigrican* which is an endemic species of South Europe and West Asia\textsuperscript{55} or alternatively from wild *Lens orientalis* Hand, which is widely distributed in the West Asia.\textsuperscript{56} As the archaeological records have shown that both the wild lentil and the cultivated lentil was first found in West Asia and, it can be safely presumed that, the centre of origin of the cultivated lentil is regarded to be West Asia around 5000 B.C.\textsuperscript{57} and has remained associated from the very beginning with the

\textsuperscript{52} Prof. G. M. Buth, Palaeobotanist, Department of Botany, University of Kashmir, Srinagar, personal communication.

\textsuperscript{53} Farooq A. Lone, et al., *Palaeoethnobotany*, pp. 210-11.

\textsuperscript{54} Ping-Hi Ho, *The Cradle of the East*, pp. 57-60.


\textsuperscript{57} Ibid.
cultivation of wheat and barley there. In India, the cultivation of *Lens culinaris* was first found around 1800 B.C. from the Neolithic levels at Chirand\(^5^8\) followed by Central Indian Chalcolithic sites of Navdatoli.\(^5^9\) However, no such reference is known from the Harappan sites\(^6^0\) which, therefore, indicates that the lentil in Kashmir must have reached from a West Asian source along with wheat and barley\(^6^1\) and was accordingly grown in Kashmir (from 3000 B.C. and onwards) later than West Asia but earlier than India. Whatever be its source, lentil contributed to the pulse configuration from the early Neolithic period and its share in the total agricultural production was as small as 1.9% around 3000-2500 B.C, 1.75% around 2500-1700 B.C. and 7.2% (including pea) around 1700-1000 B.C.

**Peas:** Pea grown in the Neolithic Kashmir was *Pisum arvense* Linn (Gofkral) and *Pisum sativum* (Burzahom). Both of these pea types are members of a single species.\(^6^2\) As direct reference indicating the emergence of the two varieties from a single source is difficult to find, it is presumed that their wild ancestor may *Pisum elatius* and the intermediary form be *P. arvense* (*P. sativum* variety *arvense*).\(^6^3\) The earliest record of *P. elatius* and *P. sativum* var. *arvense* was from the archaeological sites of West Asia of around 7000-5000 B.C.\(^6^4\) In India *P. arvense* has been found

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59 Vishnu Mittre, *Evolutionary Studies in World Crops*.
60 Ibid.
61 Ibid.
63 Ibid.
at Harappa (2250 B.C.) Chirand (1800 B.C.) and Navadatoli (1500 B.C.) while as in Kashmir, *P. arvense* has been found at Gofkral (period IB) around 2500 B.C. suggesting thereby that this cultivar reached here from West Asia, while as *P. sativum* found at Burzahom around 1700 B.C. whose record is not found from any Indian site might have developed from the intermediary form, *P. arvense*.

**Horticulture:** The cultivation of cereal and pulse plants, discussed above, by and large, marked the culmination of human effort put in at different stages in the Neolithic history of Kashmir. To be more exact, these crops entailed definite human labour to a varying degree while as there were certain horticultural products which necessitated human activity to a minimum possible level. Technically speaking, horticultural produce is not synonymous with agricultural produce, as the fruit crop is not a part of agricultural economy and does not necessarily suggest orchard culture, but the fruits have formed a part of the articles of food consumed by the Neolithic man during our period of study. It is, therefore, a fact that the share of horticulture has been calculated in the over all agricultural economy which is 10.5% around 3000-2500 B.C., 19.6% around 2500-1700 B.C. and 12.8% around 1700-1000 B.C. The variations in their estimation largely depended upon the share of agricultural produce at a given time as also because of entry of new types in the fruit economy.

**Walnut:** Walnut grew as wild along with other forest trees in the entire belt extending from Greece to Asia minor including Persia, the Himalayas and

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65 M. S. Vats, *Excavations at Harappa*.
67 Ibid.
China. The plant was available to the Neolithic man in Kashmir is suggested not only because that the endocarps of walnut, *Juglans regia*, are found from the very existence of his culture here but also as walnut grew wild during the pre-and the Neolithic period in Kashmir. This is being said on the basis of the research conducted by Vishnu Mittre who found carbonized woods, leaf impressions and pollen grains of *Juglans* spp. from the Plio- Pleistocene and post glacial deposits in Kashmir. Even though there is no record of walnut from any archaeological site of India yet it was used by certain European Neolithic people. That the Neolithic people in Kashmir knew the edible qualities of its nuts is established by the collection of its broken endo-carp, which further suggests the argument that the plant available to them was an offshoot of the wild walnut variety grown in the pre-Neolithic Kashmir. Whether or not this tree was domesticated at any stage in the Neolithic history of Kashmir is difficult to establish, but *Juglans regia* is the domesticated variety of walnut available in Kashmir at present and is said to have been domesticated locally in Kashmir.

*Prunus*: Four *Prunus* species were found from different Neolithic levels in Kashmir. These are peach (*Prunus persica*), apricot (*Prunus armenica*) almond, (*Prunus amygdalus*) and wild cherry or alich (*Prunus domestica*). Besides these grapes (*Vitis vinifera*) was also found from their deposits. In

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68 J. Hawkes, *History of Mankind*, p. 278
69 Vishnu Mittre, ‘Quatemary Palaeobotany/Palynology in the Himalayan: an Overview’, *Palaeobotanist*, Vol. 32, No. 2, 1984, pp. 158-87; the plant remains were also found during the Neolithic period, supra Chapter I and foot note 80.
70 J. Hawkes, *History of Mankind*, p. 278
addition to walnuts, in the beginning the horticulture produce comprised apricot and peach only, almonds, cherry and grapes registered their entry into the fruit configuration towards the later stages of the Neolithic period as is established by their remains at Burzahom. About the history of origin and development of apricot, it is held that its primary centre of origin was western China and secondary centre was Central Asia, likewise peach originated in western China; almond originated in a vast area extending from Central to Western Asia, whereas the centre of origin for wild cherry was in Europe. However the studies of Vishnu Mittre have shown that Prunus spp, to which all these fruits belong, was present in Kashmir during the Pleistocene period. It may, therefore, lead to believe that these plants might have grown wild in the Valley before the Neolithic man settled here. Mention may be made here that alich, still grows wild in Kashmir and, therefore, these plants might have been available locally for their exploitation as consumable products during the Neolithic times. Gapes were used in Kashmir from 2500 B.C. onwards. It is a wild species identified as Vitis vinifera, and is still found from the north eastern Afghanistan to the southern boarders of the Black and Caspian seas. It has been found, in the archaeological sites, at many places in West Asia, including Mehargarh and Nowshera in Pakistan. No pre-Neolithic record

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73 Vishnu Mittre, Evolutionary Studies in World Crops.
74 Farooq A. Lone, et al, Palaeoethnobotany, p. 144.
75 Ibid, p. 146
76 Ibid
77 Ibid.
of it has been found in Kashmir. Being in the wild stage, the plant might have reached here from the centre of its origin which lies in close geographical proximity of Kashmir. For that matter both the wild and cultivated verities of grapes are still available in Kashmir.

Summing up the evidence, the agricultural activity in Kashmir seems to have been an offshoot of the influences that were imbibed from different peoples surrounding the Valley. All that which was grown by the Neolithic farmer was of those plants whose wild ancestral types have not been recorded in Kashmir. As all their plants were of advanced types, they must have reached here in that state of evolution. We have noted above that wheat, barley and masur were cultivated in Kashmir at one and the same time from the very beginning of the Neolithic culture in Kashmir and all these types were available in that form in West Asia too. Because of this reason they might have reached here together from some West Asian source. There is no other centre or site surrounding Kashmir where all these types were available together then, even though Mehargarh in Baluchistan was an early centre of barley and wheat. But the wheat types that were grown at Mehargarh were of different varieties. Also they do not seem to have cultivated masur, which is found along with the two principal cereals in Kashmir. Unfortunately, information about cereals of the pre-Harappans is not clear who were close contemporaries to the Neolithic farmers of Kashmir, from whom these cereals have reached to the Valley as they were close neighbours to these farmers than the geographically West Asians. Harappan influence is to be ruled out as they established their centres only after the Neolithic people had settled in Kashmir.
However, pea cultivation reached Kashmir only around 2500 B.C. when Harappans too were growing it. Similarly cultivation of rice around 2000 B.C. points towards a contact that these people had established with the Chinese. It was not known in north west India at that point of time but the Lung shan people in China were certainly growing *Oriza sativa*. They possibly were the people who might have helped in the introduction of millet around this time. What however is certain is that all these products of agricultural crops would have minimized human dependence on hunting and other related means of dependence featuring food gathering. Though these crops were numerically few when compared to the present, yet they might have sufficed their needs given the land-man ratio which would have been in favour of the farmer. They might have, therefore, a surplus with them, in so far as the cereals were concerned, to be retained for lay off periods particularly the chilly winter months when other sources of food would have been difficult to get. The exploitation of horticultural products would have certainly helped to supplicate the food supplies, particularly in the winter months as they could be used also as dried form. In any case the hunting of wild animals and herding of domestic animals was there always to support the food economy.

*Animals and their Husbandry*: The remains of hunting tools such as spears, arrow heads and food processing implements like scrapes, skin cutters, etc, together with several types of animals bones and large number of bone tools recovered from Gofkral and Burzahom excavations tend to suggest that the Neolithic man used animals for different purposes. Most of the animals contributed to the human food as is certified by the fractured and
charred bones excavated from the residential areas of Gofkral site. These animals invariably comprised both wild and domesticated varieties which in a way suggest that, besides agriculture, the needs of the Neolithic man in Kashmir were met by hunting and herding, though their contribution towards the food economy varied in nature as is evident from the block diagram of their contribution at Gofkral.

Period IA

![Graph showing the percentage of wild and domesticated animals for Period IA]

Period IB

![Graph showing the percentage of wild and domesticated animals for Period IB]

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78 IAR, 1981-82.
79 A. K. Sharma, Puratattva.
This diagram makes it clear that the early Neolithic period, i.e. 3000-2500 B.C., was predominantly featured by hunting of big and small wild animals, where sheep, goat and cattle formed small and ibex, deer and bear big animals. Among these, the share of smaller animals was considerably large and they accounted for 57.6% of the total osteological assemblage of the wild animals while as bigger animals made 29.3% of it. As against this, from 2500 – 2000 B.C. the share of smaller wild animals was 55.8% and bigger animals 39%. An idea about the period wise representation of various types of wild animals can be had from the following table.

<table>
<thead>
<tr>
<th>Animals</th>
<th>Period IA</th>
<th>Period IB</th>
<th>Period IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep (<em>Ovis orientalis</em>)</td>
<td>25%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Goat (<em>Capra aegagrus</em>)</td>
<td>14%</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td>Cattle (<em>Bos nomadicus</em>)</td>
<td>17%</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Deer (<em>Cervus elephus</em>)</td>
<td>18%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Ibex (<em>Capra ibex</em>)</td>
<td>7%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Bear (<em>Ursus</em>)</td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>Dog/Wolf (<em>Canis lupus</em>)</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Fish</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>92%</td>
<td>43%</td>
<td>16%</td>
</tr>
</tbody>
</table>
The table together with the information discussed in the sequel is reflective of the fact that around 3000-2500 B.C. share of wild varieties of the animals was as large as 92% and that of domesticates, at this period of time, as small as 8% only. Thereafter the human dependence on eating wild animals seems to have come down considerably as their contribution slashed down from 92%-43% and 16% respectively between 2500 to 2000 B.C. and 2000-1700 B.C. respectively. The reason for this decrease of dependence was logically because of the fact that animal domestication had by then picked up. The share of domesticates show sharp increase from 8% to 57% to 84% during the same period of time and beyond 1700 B.C. the share of wild varieties in the osteological assemblage was comparatively negligible while the share of domesticates was almost 100%.

Among the domesticates, each animal contributed separately towards the food economy of the Neolithic man in Kashmir. Share of sheep, goat and cattle, like in wild types, was major among the domesticated animals. The share of sheep and goat was 100% at the end of period IA simply because these were the only animals domesticated then; but in company with cattle their share was 77% around 2500-2000 B.C. and 83.3% around 2000-1700 B.C. a percentage which is considerable in view of the fact that besides providing food they must have helped the Neolithic man in agricultural operations. As compared to these domesticates, pig, fowl and dog formed little and indeed very little percentage in a certain case. The period-wise share in the osteological assemblage of each of these domesticates is exhibited in the following table for simplification.
The fluctuating trend in the contribution of the two widely varying modes of sustenance, the wild and the domestic animals, may be attributed, besides all else, to the hypothetical reality that in the beginning the Neolithic man in Kashmir was ignorant of farming as a new and permanent mode of production. In its absence he was to depend upon hunting. Once he settled down at a certain place, the necessity for the village life was an established food source which he attained by producing certain types of cereal foods; and thereafter domesticated various animals to supplement the agricultural operations, and to obtain food and dress from them. The shift in human priority was the natural corollary of favourable

Charles Reed holds that primary requirement for the earliest domestication of sheep, goat, cattle and pig in West Asia was that man settled down to village life first and subsequently stock breeding came; this too after plant cultivation, 'The Domestication of Animals in the Prehistoric Near East', Science, Vol. CXXX, No. 3389, 1959; and, 'The pattern of Animal domestication in the prehistoric Near East', The Domestication and Exploitation of Plants and Animals, eds. J. Ucko and G. W. Dimbleby, Chicago, 1969, p. 367. The above observation holds well for Kashmir too as the farming pattern suggests. As in West Asia, in Kashmir too after the village life was established and after people cultivated at some stage of the earliest Neolithic period (I or IA), wheat, barley and lentil then only at the advanced stage of this period (I or IA) did they domesticate sheep and goat.
circumstances in which the Neolithic man found himself after the adoption of village life. Thus instead of following a tiresome and vulnerable mode of production as in the hunting, he preferred much easier and comparatively stable and assured source of sustenance by adapting to farming economy, particularly herding. With pastures abundantly available, as now, for the domesticates particularly the herbivorous bovid species like sheep, goat and cattle, he had hardly to earn food for them and whatever was not eaten by man himself out of his agricultural produce might have been consumed by his animals as food, high in cellulose. In return, the dung particularly of cattle, might have been utilized as fertilizer for the fields. Cattle were the first domestic animals capable of pulling a plough and if Turkepur celts were used as plough shares, there would have been not only increase in agricultural produce but even in human population. The Neolithic man, therefore, after domestication of animals, must have been little worried about the animal food to derive necessary amount of calories, proteins and oils out of them.

81 A thought more valuable to the solution of problems concerning the beginning of domestication is that sheep, goat and cattle were, by the very nature of their anatomical and physiological organisation, pre-adapted to survive on food, like grasses, straw, twigs, leaves etc. high in cellulose, which is not directly consumed by man or dog, and can be utilized only inefficiently by pigs, Charles Reed, *The Domestication and Exploitation of Plants and Animals*, p. 365. Only in community where there is an excess of human food can pigs and dogs be tolerated as a part of the biosocial community because dog, man and pig are direct competitors of food while as with bovids there is little competition for food, *ibid*, 366. Even though bovids rob the crop fields, but once under human control they can be kept away from the fields until harvest.
In estimating the per-capita food consumption in the Neolithic period, we used a simple hypothetical principle allowing each person 2300 calories derived exclusively from cereals. Nevertheless, we are reasonably sure that food-gathering, hunting, fishing and husbandry were all sources of food which together would have provided a large number of calories for the consumption of men. They were, therefore, in a broad spectrum era, making a living by diversifying their subsistence strategies, rather than concentrating on one food source. In fact, the synergistic effect of their various food combinations — meat, cereal, lentil, almond, nut, fruit — probably resulted in better nutrition than would specialization on a narrower range of products. Most calories might have come from plant foods, since none of their meat sources had a very high calorie value, except pig which however was used very limitedly and almost towards the end of the Neolithic culture. For example edible portion of one kg of goat/sheep yields, on an average 1450 calories while domestic cattle 2000 calories; accordingly

Kent V. Flannery, The Domestication and Exploitation of Plants and Animals, table 3; he has given estimated values of some of foods commonly eaten in Iran which was compiled on the basis of research of B. S. Platt, Medical Research Council, Special Report Series, 1962, p. 302. For those of the food sources found in the Neolithic Kashmir, the estimated values per kg of edible portion are:

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories</th>
<th>Protein grms</th>
<th>Fat grms</th>
<th>Carbohydrates gms</th>
<th>Calcium mg</th>
<th>Iron mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>3440</td>
<td>115</td>
<td>20</td>
<td>700</td>
<td>300</td>
<td>35</td>
</tr>
<tr>
<td>Barley</td>
<td>3390</td>
<td>120</td>
<td>20</td>
<td>680</td>
<td>350</td>
<td>40</td>
</tr>
<tr>
<td>Lentil</td>
<td>3390</td>
<td>240</td>
<td>10</td>
<td>590</td>
<td>700</td>
<td>70</td>
</tr>
<tr>
<td>Almond</td>
<td>6570</td>
<td>200</td>
<td>590</td>
<td>120</td>
<td>1500</td>
<td>35</td>
</tr>
<tr>
<td>Goat</td>
<td>1450</td>
<td>160</td>
<td>90</td>
<td>-</td>
<td>110</td>
<td>25</td>
</tr>
<tr>
<td>Sheep</td>
<td>1490</td>
<td>170</td>
<td>90</td>
<td>-</td>
<td>110</td>
<td>25</td>
</tr>
<tr>
<td>Cattle</td>
<td>2020</td>
<td>190</td>
<td>140</td>
<td>-</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Pig</td>
<td>3710</td>
<td>140</td>
<td>350</td>
<td>-</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Fish</td>
<td>950</td>
<td>180</td>
<td>25</td>
<td>-</td>
<td>500</td>
<td>10</td>
</tr>
</tbody>
</table>
dependence on cereal foods would have been more, particularly because man would derive more energy from direct consumption of such a food than what he would get after letting it first to his animals and then eating them. For example, to cycle grain through a pig before its consumption by man is to lose more than three-fourths of potential energy originally present in the grain, thus man may gain lesser degree of protein by its concentration from meat. Accordingly, even though it is difficult to ascertain the degree of dependence that this man had on each type of production separately, yet it is certain that the degree of dependence on agricultural products for sustenance would have been still lesser than 2300 calories at this period of time. By the time farming was established firmly, particularly during the middle stages of the Neolithic period, human dependence on peripatetic life aimed at gathering food from place to place might have substantially come down; agriculture may have by then been the principal mode of production while husbandry of food animals an auxiliary source of survival.

Charles Reed, *The Domestication and Exploitation of Plants and Animals*, p. 366.


W. A. Fairservis, Jr., estimates that in Harappa in ancient times the average individual derived 1500-1600 calories from cereals, consuming about 470 gms of these daily, while as the rest of the calories were derived from vegetables, fruits, meat, fish etc., *The Origin, Character and Decline of an Early Civilization*, p. 34, table 4.

Among the animals domesticated from period IB at Gokral was dog also. Dog was found buried at Burzahom, either individually or in human graves, Appendix II, supra Chapter II. Even though its bones were not found in large quantities at Gokral as compared to bovids, we have not taken dog along with the food animals. Charles Reed holds that dogs were not eaten in

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Be it as it may be, the stock breeding of all these animals in Kashmir was the offshoot of a gradual process of domestication in which sheep and goat appeared first followed by cattle, fowl, dog and pig. Such an order had closer resemblance with the domestication pattern that obtained in West Asia, even though the fundamental difference remains in the period of time, as domestication process began there as early as 7000 B.C. while in Kashmir it started towards closing stages of the Neolithic period IA and was near a date of 2500 B.C. Nevertheless the major wild types were certainly living in this geographical area around the time domestication process began here and their domesticated offspring’s might have not been difficult to establish in and around the Neolithic village if it is agreed finally what Gorden Childe once said that for successful domestication of animals it was necessary to study the animal habits to capture the young animals, tame them and to allow their breeding in captivity. Domesticated sheep (Ovis aries), for instance is believed to have originated from the wild

West Asia, *The Domestication and Exploitation of Plants and Animals*, p. 370. It has been found in West Asia and China at large number of sites but nowhere it is recorded that it has been eaten. However Allchins report dogs were until recently scarified and buried with their masters among such people as the Gilyaks, Ulchis and Goldis of the region of Upper Amur, B. and R. Allchin, *The Rise of Civilization in India and Pakistan*, New Delhi, 1983, p. 116.

Charles Reed, *The Domestication and Exploitation of Plants and Animals*.  
Gorden Childe, *What happens in history*, London, 1957, p. 24; and *New Light on the most Ancient East*, London, 1958, p. 23; Charles Reed, records that for more than 99% of their co-existence, man and other animals came together as hunter and prey, man more often being the hunter. The change to man, the domesticator, was thus a major behavioural shift in human adaptation for the utilization of animal resources, *Ibid*, p. 361.
variety of sheep (*Ovis orientalis*); likewise domestic goat (*Capra hircus*); and domestic cattle (*Bos indicus*) descended respectively from their wild types, *Capra aegagrus* and *Bos nomadicus*; similarly the ancestor of dog, *Canis familiaris* has been established to be wolf (*Canis lupus*) and wild pig was the ancestor of domestic pig (*Sus scrofa*). Accordingly the presence of these wild types at the beginning of the Neolithic period in Kashmir, i.e. 3000 B.C. might have been responsible for the domestication of these animals towards the end of the first stage of Neolithic period, i.e. 3000-2500 B.C. to allow man to exploit fully the natural resources for his benefit.

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90 Ibid, p. 130.
91 Ibid, p.130.
92 Ibid, p. 81.
93 Ibid, p. 256.