

Subsistence Economy of Indus People: Agriculture and Domestication of Animal

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Abstract

The importance of Indus civilization stems largely from the fact that it represents the first of the successful achievements of the civilization beyond the bounds of the lands that constitute the fertile crescent. The potency and vigour inherent in food production and domestication of animals were critical in sustaining the large population implied by urbanization. There is a link between development of food production and domestication and the rise of the city life. These processes led to the urbanization in Indus Valley.

Keywords: Indus civilization, domestication of animals, food production, urbanization, population

The importance of Indus civilization stems largely from the fact that it represents the first of the successful achievements of the civilization beyond the bounds of the lands that constitute the fertile crescent. It unquestionably ranks as one of the greatest civilizations of the early ancient world. The Indus civilization covered an area of approximately one million square kilometers. The westernmost Indus site is Suktagendor, near the modern border separating Pakistan and Iran. The principal regions are Baluchistan and North West Frontier, the mountainous Eastern end of the Iranian plateau. The plains of Indus Valley include the Punjab (Pakistani and Indian), Haryana and the Ganga- Yamuna Doab. The Northern and Western tracts of Thar desert of Rajasthan were occupied by the Indus people, as were the sandy north Gujarat plains, Kutch and the hilly savanna of Saurashtra. In view of the widely differing ecological conditions of the distribution area of Indus Valley civilization, the subsistence pattern is not likely to have been single or uniform one. Urban network was supported by a stable plough agriculture, supplemented by animal husbandry, animal hunting and plant gathering. In underlying bond between the cities and their hinterlands is that the existence of the former depends upon their capacity to mobilize and deploy the latter's agricultural surpluses.¹ With the arrival of farming in new landscape, human populations are given the wherewithal for rapid demographic growth as is clearly seen in situations of agricultural colonization in early historical period in India. Did similar "diasporas" happen in the Indus valley? The answer seems to be affirmative as the rich flood plains of the Indus and its tributaries, fed by monsoon rains and Himalayan snowmelt, were friendly to its agricultural production, supporting large nucleated populating centres. The search for the earliest records of food production and domestication has been guided by several principles. One of the most important has been to look in those regions within which the wild ancestors of modern domesticates are found. This was most effectively articulated by Robert J. Braidwood,² when he structured his excavations in the "hilly flanks" of the fertile crescent, the foothills

¹ Adams, McC, The Natural History of Urbanism, in G.L. Possehl ed. Ancient Cities of the Indus, p.18

² Braidwood, Robert J, Pre Historic Men, New York, 1975, pp. 103-4

of the Zagros and Anatolia, where he proposed that wild wheat and barley coexisted with wild sheep, goats, pigs and cattle. This complex which Braidwood called "a constellation of potentially domesticable plants and animals" is found from the Taurus mountains and the eastern shores of the Mediterranean Sea all across the Iranian plateau to Pakistani Baluchistan, the North west frontier and Afghanistan.³

Possehl observed the "extraordinary empty spaces" between the Harappan settlement clusters as well as isolated context for a number of individual sites.⁴ He proposes that "pastoral nomads, or other highly mobile (itinerant) occupational specialists filled in the interstices", since such spaces are unlikely to have been unoccupied. He goes so far as to suggest the pastoralists formed the bulk of the population during Harappan times since there do not seem to be any settled village farming communities there."⁵ Pastoralists and farmers co-existed "not as isolated from one another, but as complementary sub-systems: two aspects of an integrated whole. One relied on the intensive exploitation of plants and arable land, the other on the extensive exploitation of animals and pastures."⁶ Moreover the presence of pastoralists make very good sense if we see them as the mobile population which bridged the gap between the settlements as the carriers of information, as the transporters of goods, as the population through which Harappan civilization achieved its remarkable degree of integration.⁷ Bridget Allchin produces case studies to demonstrate how "nomadic herdsmen from an important element of rural life in India and Pakistan today, including the old province of Harappa culture. She adds that "there is every reason to support that they did so in Harappan times, and that they played an important part in the economy and organization of the Harappan world."⁸ Until 1930 the history of early cultivation in the Indian subcontinent depended entirely upon textual references. During the 1930s reports were published of plants remains at Mohenjo-Daro and Harappa.⁹ The large number of saddle querns found in the excavations indicates cultivation of an extensive scale. Wheat and barley were the main crops of the Indus people; wheat is reported from Harappa,¹⁰ Mohenjo-Daro¹¹ and Chanhudaro.¹² Barley is reported from mature Harappan levels at Harappa,¹³ Mohenjo-Daro,¹⁴ Chanhudaro,¹⁵ Kalibangan and Banwali.¹⁶ Wheat and barley represented all through the regions of the Indus age from the very beginning of the village farming community. In general terms it can be said that these people were wheat and barley farmers who concentrated on keeping the cattle. But there are other important plants and animals that complemented these subsistence resources. The most important is

³ Possehl, G.L. *The Indus Age: The Beginnings*, Philadelphia, 1999, p.239

⁴ Possehl, G.L., "Pastoral Nomadism in the Indus Civilization" in M. Taddei (ed.) *An Hypothesis in South Asia Archaeology*, Naples, 1979, p.p. 537-51

⁵ Ibid, p. 547

⁶ Ibid,

⁷ Ibid. p. 548

⁸ Allchin, B. *Hunters, Pastoralists and Early Agriculturalists in South Asia*" in J.V.S. Megaw ed. *Hunters, Gatherers and First Farmers beyond Europe*, Leicester, 1977, pp. 127-44

⁹ Allchin F.R. *Early Cultivated Plants in India and Pakistan*, in G.L. Possehl ed. *Ancient Cities of the Indus* pp. 250-52.

¹⁰ Vats M.S. *Excavations at Harappa, Vol. II*, 1941, pp. 466-67

¹¹ Stapf, O. "Comments on Cereals and Fruits" in J.H. Marshall, *Mohenjo-Daro and the Indus Civilization*, pp. 466-67 and 557-59

¹² Mackay, E.J.H., *Further Excavations at Mohenjodaro, Vol. I*, 1943, pp. 250-51

¹³ Luthra, J.C. "Ancient Wheat and its Variability, *Current Science*, 4.7. 1936, p. 489

¹⁴ Stapf, O. "Comments on Cereals and Fruits" in J.H. Marshall, *Mohenjo-Daro and the Indus Civilization*, pp. 466-67 and 557-59

¹⁵ Shaw F.J.P. *Vegetable remains at Chanhudaro* in E. J. H. Mackay, *Chanhudaro Excavations*, pp. 250-51

¹⁶ Bisht, R.S. *Banwali: A New Harappan Site in Haryana*, *Man and Environment* 2, 1978, p. 87.; Mintre, V. and R. Savithri, "Food Economy of the Harappans, in G.L. Possehl, ed. *Harappan Civilization*, Delhi, 1982

millets. Millets signal a new form of adaptation in the subsistence regime of the Harappan period. They significantly escalated the flexibility and adaptability of the Indus people by increasing the productivity of the monsoon (kharif) growing season and introduced the double cropping revolution to the ancient world.¹⁷ Millets formed the main food crop of Gujarat; sorghum is found depicted on a Harappan potshard from Mohenjo-Daro,¹⁸ bajra (pearl millet) from Rangpur¹⁹ and ragi (finger millet) from Rojdi.²⁰

Leguminous plants, field peas and dates, grapes and melon were other items of diet. Chick pea and pea were gathered from Kalibangan.²¹ An early identification of sesamun seeds came from Harappa, a lump of sesamun seeds were found near granary.²² Sesamun is til in most of the modern language, also a generic term for edible oil. It is an essential ingredient of Hindu ceremonial life as well as cooking. They were grown in Chanhudaro²³ and Harappa²⁴ respectively. The plant is intolerant of frost draught and prolonged heavy rain. It does well in sandy alluvium of Rajasthan, clayey soils and black cotton soils of Gujarat and central India. Today it is often generally kharif crop and intercultivated with jowar, bajra and cotton as a hedge.²⁵ India is world's leading producer of sesamun today, with heavy production in Rajasthan (Kalibangan), Uttar Pradesh (Hullas) and Gujarat (Lothal etc.).²⁶ Green and black grams are recorded from late Harappan levels at Daulatpur,²⁷ Hulas²⁸ and Atranjikhhera.²⁹ Though rice is the most popular food grain in the subcontinent today, its history is therefore of special interest to many archaeologists. Evidence of rice cultivation is not available from Mohenjodaro and Harappa. But at Lothal (single occurrence)³⁰ and Rangpur³¹ rice husks and spikelets embedded in clay and pottery have been discovered. It can not be ascertained whether the rice is of wild or domesticated variety. Based on the earlier reports, it was not certain that rice was among the crops raised by the Indus people. But recent researches show the cultivation of rice in the Indus region. Still rice cultivation seems to have complicated history in the subcontinent needs to be considered in relation to both nature of Indus Agriculture in the region and also to the domestication of rice in northern south Asia. More research incorporating systematic floatation at Indus Settlements and also those contemporaneous to Indus Civilization is needed to explore the range of cultivation practices being exploited in this complex agricultural and environmental region.³²

¹⁷ Possehl G.L, Indus Age, The Beginnings, p. 239.

¹⁸ J.H. Marshall, Mohenjo-Daro and the Indus Civilization, pl LXXXVIII.5,

¹⁹ Ghosh S. S. and K. Lal, Plant remains from Rangpur, in S.R. Rao, ed. Excavations at Rangpur and other Explorations at Gujarat, Ancient India, 18-19, 1963, pp. 165-75

²⁰ Weber S.A., Plants and Harappan Subsistence, : An Example of Stability and Change from Rojdi, Delhi, 1991.

²¹ Mitre V. and R. Savithri, "Food Economy of the Harappans", in G.L. Possehl, ed. Harappan Civilization. P.216

²² Mackay, E.J.H., Further Excavations at Mohenjodaro, Vol. I, 1943, pp. 250-51

²³ Vats M.S. Excavations at Harappa, Vol. II, 1941, pp. 466-67

²⁴ Mitre V. and R. Savithri, "Food Economy of the Harappans", in G.L. Possehl, ed. Harappan Civilization. P.216

²⁵ A Hand Book of Agriculture, Indian Council of Agricultural Research, Delhi, 1992, pp. 940-41

²⁶ Mitre V. and R. Savithri, "Food Economy of the Harappans", in G.L. Possehl, ed. Harappan Civilization. P.216

²⁷ Ibid

²⁸ Gaur, R.C. Excavations at Atranjikhhera, Delhi, 1983, p.74

²⁹ Rao, Ramesh and K. Lal, Plant remains at Lothal, in S.R. Rao, Lothal a Harappan Port Town, 1955-62, Memoirs of Archaeological Survey of India, no. 78, Vol. 2, pp. 667-84.

³⁰ Ghosh S. S., Plant remains from Rangpur, Ancient India, 16-19, P.p. 161-75

³¹ Sahnii, D.R., Mohenjodaro, Annual Report of Archaeological Survey of India, 1926-27, 1930, pp. 60-88

³² Bates, J., C.A. Petrie, R.N. Singh, Approaching Rice Domestication in South Asia: New Evidence from Indus Settlements in Northern India, Journal of Archaeological Science, xxx, 2016, 1-9.

In Indus archaeology textile production traditionally a key economic sector in south Asia - has to be inferred by indirect evidence at Mohenjodaro. Fibres were found in four contexts:

1. Two silver vases, originally wrapped in a cotton bag³³
2. Cord wound around a copper blade³⁴
3. Fabric adhering to razor³⁵
4. Fine cord wrapped around copper rod³⁶

Traces of fibre and woven cloth were found at Mohenjodaro indicating that the cotton must have been grown in Indus basin, but in a very small quantity. There is evidence that a variety of cotton known as tree cotton *Gossypium arboreum*, was cultivated in the Indus civilization. Apart from actual fibre surviving in contact with copper tools and a silver vessel, at Mohenjodaro and Harappa, numerous woven textile impressions are reported on faience vessels, etc.³⁷ which adds another dimension to the civilization. Cotton does not become common to the Mediterranean world until sometime after 700 BC. Presumably the Harappans arrived at the domestication of cotton as a response to the need which animal hair and hide and plant fibre did not fulfill. Madder (*Rubia tinctorum*), a creeper whose roots yields red dye, could have been wild or cultivated; the fragments of cotton found at Mohenjodaro have been dyed with madder. G. Watt reported the cultivation of Madder in 1908 in Sind.³⁸ This discovery of fragments of woven cotton attests the antiquity of an industry for which in later times India has been particularly famous. Cotton might have been luxury and perhaps thus became a market crop for domestic consumption. There is a long history to believe that ancient India was the home of cotton, as indicated by the fact that the usual word for this material in the west Asian languages is "Sindhu" or some variation of it. The earliest textual reference in the near east is Sennacherib's (705-651 BC) mention of "trees bearing wool" that were sheered and wool woven to garment.³⁹ The desi or traditional method of cotton cultivation in Sind is known as Belai. Under this simple system the plant is grown as a kharif crop, planted in summer following inundations of the Indus and picked up in November. Sorley also describes second and more intensive system of kharif cultivation for cotton on the Indus plains as well as rabbi (winter method).⁴⁰ None of these three methods had technical bars that would have prevented its use during the second half of the third millennium.

Number of principal grains and plants found in the Indus province, or even in the adjacent parts of the peninsula, appears to have been first domesticated in West Asia and to have entered South Asia probably along with the spread of cultivation in subsequent centuries.⁴¹ Several of the plants are almost certainly indigenous. Among those we notice rice, cotton, sesamum, and Indian mustard. The history of crops seems to begin with barley and wheat in the early Harappan times and which was subsequently

³³ Mackay, E.J.H., Further Excavations at Mohenjodaro, 1937-38, p. 441, DK 8376

³⁴ Ibid, pl. CXVIII, no. 7

³⁵ Ibid, DK 5844

³⁶ H. Marshall, Mohenjo-Daro and the Indus Civilization, pp. 585-86; Vats M.S. Excavations at Harappa, Vol. II, 1941, pp. 467

³⁷ Watt. G. Commercial Products of India, London, 1908, p.p. 926-27

³⁸ Cited in Possehl, The Indus Age: The Beginnings. 239

³⁹ Sorley, H.T., "The Former Province of Sind (including Khairpur State), The Gazetteer of West Pakistan, Karachi, Govt of West Pakistan. P. 412-13

⁴⁰ Allchin F.R. Early Cultivated Plants in India and Pakistan, in G.L. Possehl ed. Ancient Cities of the Indus pp. 250-52.

⁴¹ Lambrick H. T. Sind_ A General Introduction, History of Sind Series, Vol. I Hyderabad, 1964.

enriched by the later innovation and introduction of new crops like gram, mustard, cotton and sesame, in the mature Harappan times and ‘millet and sorghum’⁴² were added in the late Harappan times.

Lambrick,⁴³ from his intimate personal knowledge of Sind⁴⁴ suggests how the crops were grown in the riverine tracts of Indus. The principal food grains (wheat and barley) would have been grown as spring (rabi) crops: that is to say, sown at the end of the inundation upon land which had been submerged by spill from the river or one of its natural flood channels, and reaped in March or April. In modern practice such plough is neither ploughed nor manured, nor does it require additional water. Lambrick remarks that the whole operation involves absolute minimum skill, labour and aid of implements. Other crops such as cotton and sesamum would be sown as autumnal (kharif) crops: they would be sown at the beginning of inundation and harvested at its close, in the autumn. For this fields surrounded by earth embankments would be required, most probably along the banks of natural fertility of the alluvium, and the annual inundation. Both systems are still in use and they provide a very convincing explanation of the means by which the Harappans filled their vast granaries; and yet neither of them has left any surviving traces for their archaeologists.⁴⁵

Despite new excavations and voluminous materials there is still a challenge for those who study this civilization. There is, for example, little in the way of knowledge concerning the specific institutional configurations of the Indus civilization. Based on the presence of granaries at both Mohenjodaro and Harappa, Sir Mortimer has suggested a redistributive economy on the Mesopotamian model.⁴⁶ "The granaries indicate that payment to labourers was in kind. As in the Indus Valley, all important cities in the Tigris-Euphrates Valley had granaries. A text from Ur implies that one of the granaries stored enough barley to provide wages for 4020 days, another text refers to the commandant of the granary who was responsible for seeing that 10,930 man-days payment was made out of his store, presumably in barley, to meet the wages of the workers from the town; the workers included scribes, overseers, shepherds and irrigators. Another text refers to royal barley, to be returned with interest, received by Lulamu from the granary of the canal bank. All these documents are of c. 2130-2000 BC. Another tablet of the same period records a harvest gathered from certain fields belonging to the temple of Nan- She in Lagash."⁴⁷ This inference has been challenged by A. Marcia Fentress.⁴⁸ But it has not been replaced by an alternative which provides an insight into the nature of Harappan economic organization. It is evident to many who have evaluated the quality of data from major excavations which opened this civilization to the world⁴⁹ that they offer very little guidance in clarifying this problem. This suggests that the renewed excavation is called for, with more clearly defined objectives incorporating elements of hypothesis testing.

⁴² See Pokharia, Anil, Jeewan Singh Kharakwal, Alka Srivastava, Archaeobotanical evidence of millets in the Indian Sub-continent with some observations on their role in the Indus civilization, *Journal of Archaeological science*, Vol. 42, February 2014, p. 442-455.

⁴³ As suggested by B. and R. Allchin, *The rise of Civilization in India and Pakistan*, p. 192

⁴⁴ Ibid

⁴⁵ Wheeler R.E.M., *Civilization of the Indus Valley and Beyond*, London, 1966, p. 35

⁴⁶ Wheeler R.E.M, *Indus Valley Civilization*, Cambridge, 1968, p. 135

⁴⁷ Ibid. p. 135.

⁴⁸ Fentress A Marcea, "Resource Access, Exchange systems, and Regional Interaction in the Indus Valley: An Investigation of Archaeological Variability at Harappa and Mohenjodaro, , unpublished Ph. D. thesis Department of Oriental studies, University of Pennsylvania, cited in G.L. Possehl ed. *Ancient Cities of the Indus* p. vii

⁴⁹ H. Marshall, *Mohenjo-Daro and the Indus Civilization*, 3 vol.; Vats M.S. *Excavations at Harappa*, 2 Vol., 1940.

Harappan cultural zone fell in the low rainfall area, and it is likely that irrigation was necessary for cultivation. Harappans practiced canal irrigation, which was also known in Mesopotamia, as a canal built by Indus people has been traced near Shortughai, drawing water from Kokcha river; there is therefore, some likelihood that similar canals were excavated in the Indus basin. A likely conjecture is that the fields were irrigated by regular floods in the rivers of the Punjab and Sind. Irrigation was also provided through Katcha wells dug in the villages to secured ground water. A stone masonry well, built on higher ground, has been discovered in Allahdino (near Karanchi) which may have helped to irrigate lower lying fields.

Enough surplus food was produced to feed the population of the town due to fundamental advance in the tools of agriculture, marked by the appearance of plough, in times of early cultures. Its presence during the Indus civilization is confirmed by the discovery of the clay model of the plough at Banwali⁵⁰ and at Bahawalpur.⁵¹ Although during the Harappan levels we do not have any direct evidence of any plough or plough share yet there are some indirect evidences like the early Harappan ploughed field from Kalibangan I,⁵² a heavy chert blade 12" long with double sloped edged from Mohenjodaro,⁵³ suggested to have been used as a plough share. A ploughed field has also been found at Indus settlement at Shortughai in northeast Afghanistan. It has also been suggested that Harappans used a toothed harrow, which is employed to this day by Indian peasants for cultivation of softer earth. It may not be likely that copper sickles being expensive, were scarcely used.

In contrast to Nile and Euphrates Valley, agricultural ecology of Indus was different. The Indus is the largest of the three rivers with an enormous catchment and a great depth of alluvium deposited on its vast flood plain. It is an enormously destructive river, proportionate to its catchment and volume of water. Through history it has major shift of course across its valley. It is not known what precise course it took in Harappan times, but up into the early historic period much of the water of the Indus system was discharged into the Rann of Katch.⁵⁴

Stock Breeding

Before 1947 scarcely any excavation reports thought fit to mention animal remains. The work of Sewell and Guha for Mohenjodaro⁵⁵ and Prashad for Harappa⁵⁶ suggest that animals were domesticated by the Harappans. Three quarters of the Harappan terracotta represents cattle. Zebu (*Bos indicus*), the humped south Asian cattle, was the most important animal of the Indus age. The remains of the cattle are

⁵⁰Bisht, R.S. "Further Excavation at Banwali, 1983-84 in B.M. Pandey and B.D Chattopadhyaya eds. *Archaeology and History: Essays in Memory of A. Ghosh*, Delhi, 1987, pp. 135-56, pl. 26

⁵¹ *Indian Archaeology: A Review*, 1983-84, p. 26 pl 33

⁵²Lal, B.B., "Perhaps the earliest ploughed field as far excavated anywhere in the World," *Pratattva* \$, New Delhi, pl. 3 Idem, "Kalibangan and the Indus Civilization" in D. P. Agrawal and D. K. Chakravarty eds. *Essays in Proto History*, Delhi, 1979, p. 65-97, Idem, *Proto historic Investigations: The Indus and the Ghaggar Valleys and Baluchistan*", *Ancient India*, No. 10-11, New Delhi, 1955; Lal, B.B. and B.K. Thapar, *Excavations at Kalibangan, New Light on the Indus Civilization*, CF 9.4 1967, pp. 78-88

⁵³ Ratnagar Shireen, "The Ancient river Basin Agriculture" (The Bronze Age), Xerox Copy, p. 14, cited in R. C. Thakran, "Dimensions of Proto- Historic Subsistence Pattern in Haryana, Proceedings of Indian History congress, Calcutta, 1997, pp. 996-1005

⁵⁴ Ratnagar, Shireen, "An Aspect of Harappan Agricultural Production," *Studies in History*, 2, 1986, pp. 137-53

⁵⁵ Sewell, R.B. and B.S. Guha, "Human Remains in Mohenjodaro and Indus Civilization" in Sir John Marshall ed. *Mohenjodaro and the Indus Civilization* vol 2, London, 1931, pp. 599-648

⁵⁶ Prashad, B. "Animal Remains from Harappa," *Memoirs of Archaeological Survey of India*, 1936, no. 50

predominant in all the sites of the time and by mature Harappan they are expected to constitute half of the faunal remains from any given site. The study of animal remains from Harappa seems to indicate that they belong to humped cattle.⁵⁷ The Harappan Seal tablets depict a number of animals, but eight are most common. Four are wild animals of the grasslands: rhinoceros, elephants, buffalo, and tiger. Their number is lesser than the seals of goat, zebu, shorthorn bullock, and famous unicorn bull.⁵⁸ The Indian humped bull or the "Brahmani bull" is frequently represented on the seals. It seems to have been sacred animal as is today. The breed depicted on Harappan seals corresponds remarkably with the modern breed in Sind and Gujarat. Possehl⁵⁹ has listed 1218 bull seals for mature Harappan, of these 54 are Zebu seals, the remaining 1164 are so called unicorn, an animal that appears to be representation of unhumped bull (*Bos taurus*). The presence of so much of imagery of unhumped cattle in the mature Harappan, in the absence of confirming osteological evidence, is one of the unsolved issues in the study of Indus age. There is an exceptional example of copper bronze figurine of cattle from Kalibangan.⁶⁰ It can be inferred that the ox drew the plough and the cart and the cow provided milk, and both formed a major source of food for the Indus people. Cattle must have been of extraordinary importance for Indus people. The presence of cattle in large number calculated from the faunal studies (though still underestimated) and also cattle imagery most prevalent aspect of Harappan art: the seals, figurines, painted Kulli pottery, Damb Sadat and late Kot Dijjian pottery - it can be assumed that cattle were too prominent wealth for these people and must therefore have been great source of prestige.⁶¹ Sheep bones along with those of the goats are common in virtually all the Indus sites. Their biological affiliation makes a separation of bones of these two animals vexing for archaeo-zoologists. Sheep (*Ovis sp*) has always been bred to produce wool. The fact that sheep bones outnumbered the goat (*Capra hircus aegagrus*) bones at Harappa may mean that sheep were in much greater demand as a source of wool. Sheep finely represented on Indus sculpture⁶² and goat represented on bronze metal⁶³ have been the source of meat and milk. It is curious that though the goat occurs on Indus seals,⁶⁴ there is no representation of sheep on the seals. Surprisingly horse is not depicted on any of the seals; nor it is recognizable among any terracotta figurines. It is doubtful that Indus people had access to domesticated horse,⁶⁵ The bones so far attributed to the domesticated horse (as at Surkotada) are almost certainly those of the wild ass (onager), which are still found in the Kacch region. We have reddish dog of Mehula as a tribute to Ibbi Sin. A statue was made of it and taken to the temple as a votive gift to Nanna. The name of the dog translates, "he bites!"⁶⁶ We have evidence of cat from Harappa⁶⁷ and

⁵⁷ F. R. Allchin, Early Domesticated Animals in India and Pakistan, "G. L. Possehl ed Ancient Cities of the Indus.

⁵⁸ Fairservis Walter Jr. , Cattle and the Harappan Chiefdoms of Indus Valley, Penn Museum, Vol. 28, issue 2. Originally published in 1986. Expedition, 28(2), <http://www.penn.museum/sites/expedition/?p=6017> accessed on 5 June, 2023

⁵⁹ Possehl, G.L. Indus Age, The Beginnings, p.175

⁶⁰ Ibid.

⁶¹ Fairservis, W.A. Jr. "Cattle and the Harappan Chiefdom of the Indus Valley," Expedition, 28(2), pp. 43-48, Penn Museum, Vol. 28, issue 2 <http://www.penn.museum/sites/expedition/?p=6017> accessed on 5 June, 2023 ;also cited in Possehl, G.L. Indus Age, The Beginnings, p.177

⁶² Mackay, E.J.H., Further Excavations at Mohenjodaro, 2 Vol., 1937-38, pl LXVI no. 23 Showing Ram figure, p. 671pp. 250-51

⁶³ Ibid, p. 690.

⁶⁴ Joshi, J. P. and A. Parpola, A Corpus of Indus seals and Inscriptions, Vol. I, Helsinki, 1987

⁶⁵ The claims for the presence of Horse at Harappa(Prashada, 1936), Ropar(Bholanath, 1938) Mohenjodaro(Sewell and Guha, 1931a) and Kalibanga(A.K. Sharma, 1990 p. 382) has been refuted(see IAR, 1964-65, p. 38) as domestic ass has been identified in preliminary report at Kalibangan. It must have been used as pack animals.

⁶⁶ Ur Excavation Texts, Vol. VIII; Sollberger, 1965, vol. 2, p. 37, line 9-13; cited in G.L. Possehl, The Indus age, p. 191.

⁶⁷ Prashad, B. "Animal Remains from Harappa," Memoirs of Archaeological Survey of India, 1936, no. 50, p. 17

in the sub-continent, we are still not sure whether cats were domesticated or they were wild. In addition animal food was eaten, including beef, mutton, pork, poultry, the flesh of the gharial, turtle and tortoise, fresh river fish and dried fish from the sea, and also shell fish. The half burnt shells and bones of these animals found in the houses, lanes and streets definitely indicate that they were articles of diet. Skeleton remains of the Indian humped bull, the buffalo, the sheep, the goat, the elephant, the pig and the camel have been recovered. The elephants rhinoceros and tigers, all of which inhabit forests, are among the animals depicted on the Harappan seals. The elephants remains from Mohenjodaro,⁶⁸ Harappa,⁶⁹ Lothal,⁷⁰ Surkada,⁷¹ Chanhudaro⁷² and Kalibangan⁷³ suggest the presence of elephants in Indus area. But there is no conclusive evidence for the domestication of this animal; even the modern Indian elephant is wild in a technical sense, but it may have been tamed for heavy lifting and pulling. Elephants must have been hunted for ivory which was much in demand for ornaments and small tools. Camel bones are found from Mohenjodaro,⁷⁴ Harappa,⁷⁵ Surkotada⁷⁶ and Kalibangan.⁷⁷ The presence of considerable number of bones belonging to young individuals of cattle and pig show that they were reared for food. Fish (*Rita rita*, *Wallago sp.* and *the carp*) bones with cut marks on them suggest that they were used for food.⁷⁸ The presence of the remains of a number of other aquatic animals such as gharial, the turtle in burnt condition indicates that they were undoubtedly articles of diet.⁷⁹ Wild animals and fishes were hunted for food. A fisherman with two nets is shown on the potshard of Harappa. As late as AD 1333 an Arab traveller saw a rhinoceros in Sind, and in the later centuries the British hunted tigers in the Indus Valley. Clay model of toys indicate that Indian bison, the rhinoceros, the tiger, the monkey, the dog, the bear and the hare were known to the inhabitants. The food of the people may have comprised of mutton, pork and poultry etc.

Fauna associated with the Mature Harappan Civilization and the late Harappan cultures are largely dependent on grassland and open forest country. The sambhar deer, gazelle, tiger and boar prefer the open hills of the steppe or scrub, forest type. The gazelle and boar specially prefers marshy conditions. The rhinoceros, elephants and buffalo on the other hand prefer high grass. The presence of these animals indicates that the climatic conditions of the regions concerned were such as to favour a suitable habitat for them. Even if no major shift in climate is postulated it may be reasonable to expect a slightly higher rainfall throughout the area before the natural vegetation cover was depleted by man's interference - intensification

⁶⁸ Sewell, R.B. and B.S. Guha, Reports on Collection on Bones Made by Sir Aurel Stein in Makran" in A. Stein's "An Archaeological Tour in Gedrosia Memoirs of Archaeological Survey of India" no. 43, 1931; Stack- Kane, Victoria, Animal Remains from Rojdi, in G.L. Possehl and M.H. Rawal ed. Harappan Civilization At Rojdi, Delhi, 1989, p. 183

⁶⁹ Bhola Nath, Remains of Horse and Indian Elephants from the Pre Historic sites of Harappa(West Pakistan)" Proceedings, All India Congress of Zoologists, pt. 2, Scientific Papers, 1959, pp. 1-14.

⁷⁰ Bhola Nath and G.V. Srineevasa Rao, 'Animal Remains from Lothal excavations,' in S. R. Rao, Lothal : A Harappan Port Town, Memoirs of Archaeological Survey of India, No. 78, vol. 2, p. 640

⁷¹ Sharma, A.K. , "Animal Bone Remains" J.P. sharma, Excavations at Surkotoda, 1971-72m 1990, p. 380

⁷² Mackay E.J.H. Chanhudaro Excavations, p. 14

⁷³ Indian Archaeology: A Review, 1964-65

⁷⁴ Sewell, R.B. and B.S. Guha, Reports on Collection on Bones Made by Sir Aurel Stein in Makran" in A. Stein's "An Archaeological Tour in Gedrosia Memoirs of Archaeological Survey of India" no. 43, p. 660

⁷⁵ Prasad, B. " Animal Remains from Harappa," Memoirs of Archaeological Survey of India, 1936, no. 50, p. 17

⁷⁶ Sharma, A.K. , "Animal Bone Remains" J.P. sharma, Excavations at Surkotoda, 1971-72m 1990, p. 380

⁷⁷ Indian Archaeology: A Review, 1964-65

⁷⁸ Belcher, William R., Marine and Riverine Resource Use during the Indus Valley Tradition: A Preliminary comparison of Fish Remains from Balakot and Harappa," in R and B Allchin, eds. South Asian Archaeology, 1995, Proceedings of 13th International Conference of the European Association of South Asian Archaeology, 1997, pp. 173-86.

⁷⁹ Sewell, R.B. and B.S. Guha, "Zoological Remains" J. H. Marshall, Mohenjo-Daro and the Indus Civilization, vo. II p. 649-73, B. P. Sahu, From Hunters to Breeders, Delhi, 1988, p. 114

of agriculture and grazing of domesticated animals.⁸⁰ Grasslands which were habitat of big game were coincidentally the area's best suited for agriculture and the grazing of domesticated animals. This obviously spelled doom for larger wildlife and not surprisingly many are missing in the region today.⁸¹

A wide variety of cereals and crops reflecting on agriculture has been obtained from various sites. Wheat, barley, rice, dates, varieties of leguminous plants, such as field peas, sesamum and mustard, presumably for oil were grown. Some judicious balance seems to have been struck by the Harappans between the meat and vegetable components of the diet. Dental disease pattern indicates a longer period of dependency on agricultural subsistence strategies. And yet we have rich evidence of hunting, fishing and animal husbandry. Therefore it seems reasonable to infer that some delicate balance must have been achieved between the two components of the diet. The mastery of agriculture and management of domesticated animals was one of the great revolutions in human history. This led to the significant changes in the human society and increase in population. The potency and vigour inherent in food production and domestication of animals were critical in sustaining the large population implied by urbanization. There is a link between development of food production and domestication and the rise of the city life. These processes led to the urbanization in Indus Valley.

⁸⁰ B. P. Sahu, *From Hunters to Breeders*, Delhi, 1988, p. 164

⁸¹ Fairservis, W. A., *The Harappan Civilization, New Evidences More Theory*" in G.L. Possehl ed. *Ancient Cities of The Indus*, pp. 49-65