

THE ENVIRONMENTS THAT LEAD TO THE RISE AND FALL OF KALHORAS

BY
M.H. PANHWAR

My definition the History is that it is the history of production, it is a history of the means of production, it is a history of distribution of production. Since production is controlled by soil water and climate, it is directly controlled by environments and thus the history essentially is the history of environments of the past. The country like Sindh, which to its western hill tracts (Kohistan) is an extension of Irano-Baloch desert and to the east, its sandy Thar is an extension of the Great Indian Desert, is essentially a desert, but for its central alluvial plains which are irrigated by the river Indus, making that area a vast oasis in the midst of the two harsh deserts of the world. The history of Sindh therefore is the history of production by the river Indus waters, soils and climate, a history of prosperity and poverty brought by fluctuating levels of the Indus, a history of its changing courses which invariably have lead to famines, starvation, deaths and change of dynasties with each such atrophy. The Indus plains have supported as much as 80% population of Sindh. The fluctuations in the level of river Indus are governed by snow millets in Himalayas. When summers are mild and snow melt is reduced, the level of water in the Indus goes down. In such cases canals do not flow to their full capacity, the area under cultivation is reduced and so is productivity. When it is warm in the Himalayas canals flow full and area under cultivation is increased. The level of water in the Indus is also governed by the rains in the catchments of its five rivers in the Punjab and Kashmir. When rains are sporadic, flood conditions prevail in the Indus in Sindh. Thus history of production in Sindh also depends upon climatic conditions in the East and West Punjabs, Kashmir and the Himalayas Ranges to their north.

The Thar and Kohistan support about 20% of the total population of Sindh on pasture lands and their prosperity depends upon the rainfall in Sindh. When there are long periods of cold, rainfall is also reduced and this reduces the area under cultivation. The people then resort pastoralism. Since pasture can not support the whole population of Sindh, famine conditions prevail and population is reduced, due to over all low production. When the production is low not only population is reduced but quality of socio-economic life is affected in all spheres of life.

To control the production and its distribution the ancients developed caste system; kings (Khatris) to subdue the people by the force of armies; Brahmans (educated and religious people) to collect taxes, administrate on behalf of king and to regulate and distribute among the whole population not according to their contribution to production but according to their ability to buy, Vaish to cultivate the land and to trade the various items of production and finally the artisans (Sudra) who produce goods and services for the use of the above three communities as well as for them-selves. The caste system probably originated during the Early Indus Civilization and was adopted by the people who

professed the Aryan religion many a millennia later. The caste system existed in Mesopotamia, Ancient Egypt, Meso-America, and Hwang Ho (the yellow river) valley. Thus there is nothing wrong with caste system as it was developed to encourage production and regulate its distribution. The caste system became oppressive in the rigid and a decadent society in India later on and its influence on production become negative.

Warm climate and Rise of Civilization in Sindh 7500-2000 BC.

Climate of Sindh has never remained the same and so has the prosperity. From 7500-2000 BC, it was a warm period and there was more rainfall. The river Indus was flowing full. Summer crops of millet, sorghum, and rice were yet unknown, but water from the Indus was diverted in to depressions and low lying lands and was drained out in October to raise winter crops (wheat, oats, oil seeds, vegetables and etc) on preserved moisture. The prosperity of raising crops lead to the rise up Mehrgarh (6500 BC), Amri (3700 BC), Kot Dijji (3300 BC) and Mohenjo Daro (2300-1600 BC), an un-interrupted civilization lasting for some 5000 years and yet unparalleled in Sindh existed. [Ref. Chronological Dictionary of Sindh pp. XXI to XXVI and 17 to 50].

Aridity and Fall of Indus Civilization (200-900 BC).

The climate started changing to aridity around 2000 BC, and around 2000 BC, it become bad enough to bring an end to Harappa in 1750 BC, and Mohenjo Daro in 1650 BC. The Mohenjo Daris resorted to pastoralism and as would normally happen, to survive they put more animals to graze in the whole Sindh than its scanty vegetation could support, leading to further deterioration of land (means of production) and society. This is commonly called Jhukar Culture. The climate further changed to hyper-aridity around 1300 BC, and the culture further disintegrated. This lasted up to 900 BC, and is known as Jhanghar culture. [Ref. Chronological dictionary of Sindh, pp. 51-60).

Shortest period and conquest of Sindh by people from steppes (519-324 BC).

After 900 BC, climate improved but not adequately enough to match cultural developments that were taking place in rest of South-Asia. It seems that climate improved from the last quarter of the 6th century BC, to about 300 BC. This was a period when Sindh which extended up to Multan, became prosperous and was conquered by Achaemenians, to whom it paid heavy taxes, but within a 100 years of their rule it became independent under local principalities. When Alexander attacked Sindh in 326 BC, the seven principalities namely; Malloi, Oxydrades, Musicanus, Sambas, Oxycanus, Moeres-Iand Moeres-II fought vehemently and shattered the greatness of the great conqueror and He had to leave Sindh in a rush through Makran desert, which finally defeated him with its treeless, waterless and unfriendly environments. He was finally poisoned in Babylon a year after he left Sindh. This only shows that if climate is good, there is an increase in population, added with prosperity and then people become ready to fight for the land to which they get so attached. [Ref: Chronological Dictionary of Sindh, pp.68-84].

Aridity and conquest of Sindh by the Central Asian tribes (200 BC – 356 AD).

The aridity prevailed again to various degrees up to about 400 AD. Whenever there is aridity over vast areas of the World the pastoral people from steppes, pounce on the peaceful people of irrigated river valleys and in this case Sindh was occupied by the Central Asian pastorals namely; Bactrian Greeks, Scythians, Parthian, Kushans and finally Sassanians of Iran. Their occupation becomes oppressive accompanied by local rebellions and they left few monuments in Sindh. Under them no Buddhist stupas worth the name were constructed. [Ref: Chronological Dictionary of Sindh, pp. 84-108].

Warm wet period and Buddhist Glory 400-700 AD.

From 400-700 AD, it became warm and the country became prosperous. We have the records, which show that the Vahlikas rulers of Sindh repelled Chandra Gupta-II; Rai Seharas-II defeated Persian army in Makran in 1600 AD, though he himself was killed; Rai Sehasi-II repelled Harasaha between 620-630 AD, and Brahmans under Dhahar repelled 14 attacks of Arabs. Almost, all major Buddhist stupas have been built during these 300 years of Sindh's posteriority brought by favorable climate. [Ref: Chronological Dictionary of Sindh, pp. 108 to 135].

Dry climate, Fall of Sindh to Arabs and 140 years of Civil War against Arabs.

From 700-900 AD, was a dry period throughout the world. Expansion of Islam and weakening of Byzantine Empire is considered due to aridity around Southern Mediterranean from 630 AD, onwards. Around 700 AD, the river Indus changed its course, deserting the canals system in the whole southern Sindh, which was vacated by the populace and the Arabs armies marched under Muhammad Bin Qasim through this deserted area unhindered. A few years aridity had weakened Sindh so much that Sindh fell an easy pray to the Arab armies. From 714-854 AD, in a period of 140 years, Umayyad and Abbasis respectively besides Muhammad Bin Qasim sent 10 and 29 governors to Sindh. Due to aridity most of the people of Sindh had resorted to pastoralism. The canal cultivation was also limited due to change of course of the river and disuse of canals due to Arab Governors' unfamiliarity with the canal irrigation as practiced in Sindh. People were not in a position to pay the taxes and when forced by the Arab governors, they resorted to fighting back and so boldly that 21 of the governors were dismissed by Damascus and Baghdad for their inefficiency to control rebellions, 13 were killed in action in local wars and only 5 returned back honorably. (The rebellions in Sindh are discussed in details by the present author in Chronological Dictionary of Sindh, pp. 136 to 184). The civil war finally leads to take-over by Habaris of the Arab decent, who had been naturalized by 125 years of marriages of their ancestors with Sindhi women. They had support of the local tribes and to their luck soon climate had started improving and so the productivity and population.

Climatic Optimum i.e., warm west climate 900-1250 AD.

The period 900-1250 AD is considered as “Climatic Optimum”, in the whole world. With more rainfall and high river water levels, in the river the canals in Sindh flowed full. Sindh prospered. A large number of Arab travelers visiting Sindh during the period have talked about prevailing peace and prosperity of the people and benevolence of their kings. They have described various items of production including fruits, vegetables, food items and textiles and how peacefully people of various faiths lived together. During this period even the Buddhist stupas were being repaired and renovated. Hinduism, Buddhism and Islam, co-existed side-by-side peacefully. Local and international trade prospered, as it had never before. [Ref: Chronological Dictionary of Sindh, pp.184-207].

In 1011 AD, Habaris were replaced by Soomras in 1011 AD, probably their close kith and kin. From 900-1250 AD, the area under cultivation may have been 2.0 million acres and population over 3.0 million people, as that the Kohistan could support twice the population as they do now.

This climatic optimum become over by about 1250 AD, or the latest by 1300 AD, Sindh, and troubles started for Soomras (1011-1333 AD). [Ref: Chronological Dictionary of Sindh, pp. 207-291]. Due to even mild aridity, Sindh could not support the population as before and Sammas the local cultivators over threw Soomras. To usurp their lands, they converted Soomras to the lowest caste i.e., Sudras and imposed on them the jobs of artisan class considered menial work in south-Asia, turning them into carpenters, blacksmiths, pottery-makers, hair-dressers, brick-layers, masons, painters, and etc. They usurped their lands, because canals could not irrigate all the land as they did during the “Climatic Optimum”.

Mild climate 1300-1525 AD and Samma Rule.

Under Sammas (1333-1525 AD), climate though arid was not too harsh and although area under cultivation had decreased and so did the population but yet it was not as severe, as during the Jhukar and Jhanghar or the Arab Governors’ period and therefore on taking-over, they were able to stabilize conditions, after an initial period of turmoil.

The climate during Sammas period was mild, rainfall was medium, the river levels were also medium and river maintained a stable course. In general the conditions were average. The climatic conditions remained unchanged throughout the world. Delhi Sultanate under Tughlaqs had deteriorated due to dry condition in the first half of the fourteenth century, the period that brought the down fall of Sumaras too. Dry conditions in the Central Asia in the whole 13th century, which had brought Mongol invasions and end of Abbasid Caliphate, had ultimately laid to small Mongol principalities in the whole Central Asia in the 14th century and they had been involved in petty feuds and rivalries among themselves. There was no power left either in South Asia or Iran and the Central Asia to capture Sindh, which was peaceful during the 15th century. [Ref: Chronological Dictionary of Sindh, pp. 291-379]. The population of Sindh could not have been more than 2.4 millions and area under cultivation not more than 1.6 million acres.

Little Ice Age (1525-1850 AD).

Little Ice Age was a coldest period in the whole world from 1480-1850 AD, within past 10,000 years. It started in Europe and Northern America sufficiently early and in the Central Asia around 1500 AD, causing aridity, starvation and movement of tribes for fertile lands in the irrigated river valleys. There were attempts to conquer Sindh after 1490 AD, but these were repelled successfully by Jam Nizamuddin's Vazier Darya Khan.

In the early 16th century Babar rose to power and pressed Arghoons and Tarkhans to vacate Qandhar. The latter had no option but to invade Sindh, to conquer and to save their clans from starvation. Even for Babar environmental conditions were too severe to sustain him-self in Samarkand and he successfully captured Delhi in 1526 AD, one year after Shah Beg's conquest of Sindh (That Shah Beg conquered in 1519 AD, is a mistake of Mausumi). For Arghoons and Tarkhans there was no alternative but vacate all cities of Sindh and inhabit them with their own people. By this time, Sindh also came in the grip of the Little Ice Age.

A recent scientific investigation has shown that the global temperatures started dropping from 1430 AD. These were felt in the Central Asia around 1480 AD, first, but the situation started worsening there after 1500 AD, leading to migration of the Central Asian tribes, to the South-Asia from 1520 to 1660 AD. The process as applied to Sindh can be explained as under.

If temperatures in the plains of the South-Asia drop by 0.5°C and Himalayas by 1.0°C, the effect as compared to the normal year, for example say 1930 AD, shall be:

- Snow which normally melts in Himalayas by about 1st April, will melt about 15-30 days later, i.e., 15th April to 1st May.
- Melting of snow which reaches its peak by about 15th June now, will be delayed upto end June and low temperatures will retard monsoon in Himalayas by about another 15 days.
- The inundation season will be delayed by about 15 days and peak snow-melt flood (not monsoon) will reach Sindh by about end July.
- The level of water in the Indus will be lower than the normal by several feet and inundation canals will flow, but with low level of water. The only alternate for people will be to lift water by Persian-Wheels and grow sorghum and millet in place of rice. Masumi describes such Persian-wheels operated by camels in Baghban area.
- The monsoon will be late by 15 days and would occur from 15th July to 15th August, rather than from first July.

- The monsoon rains will bring flood water in the Indus and peak will reach Sindh between 1st August to 1st September.
- September will be cooler than now.
- Winter will start at least 15 days early i.e., from 15th October rather than 1st November and will continue up to 15th March, rather than 1st March as now.
- The implication of this 0.5°C temperature drop, on inundation irrigation crops like rice and others will be as under:

Canals will start flowing 15 days late and reliable supplies of water for rice transplantation will be available from 15th July.

- A canal like the Western Nara will no longer be perennial and will not exist in its tail-end and therefore there is no mention of Nara in Sehwan Sarkar by Mazahar-Shah-Jehani.
- The level of water in the river will start falling from first September and the canals will not flow at all after 15th September.
- Rice if transplanted on July 15th will grow but will not mature due to lack of water in September and start of early winter in October.
- Only poor quality rice like Rathio, Gango, Kangni, and etc., which take 60 days to mature can be raised and not the quality rice like Sugdasi.
- Inferior varieties of rice have low yield of 50-60% of quality rice, and therefore total production will decrease.
- In order to mature rice earlier they will be broadcast, rather than transplanted. This will further reduce yields to 2/3rd.
- The rice production will therefore be only 40-50% of normal.
- Sorghum and millet, short season crops, will grow and mature. They will replace rice, but their yield per acre are much less than rice and production cannot support the population of Sindh.
- The long winter will help wheat and other winter crops, but acreage under these crops will be limited due to non-availability of water in winter. The riverine areas will grow wheat and oil seeds but area will be limited.

- People will resort to pastoralism and put more animals in the desert areas of Thar and Kohistan and extra pressure of animals on scanty vegetation, resources, will create desertification and reduce capability of Thar and Kohistan to support extra animals.
 - In general there will be food shortage and famines, which will increase death rate, till population balances availability of food. The Little Ice Age appeared in Sindh around its conquest, by Arghoons in 1525 AD. The temperatures kept decreasing and so the agricultural production. Local rebellions started and they could not be crushed until end of Arghoon – Tarkhan rule of Sindh in 1591 AD. They further continued under the Mughal Governors.
 - By about 1578 AD Sindh had worst famines lasting for some 7 years. Mirza Baqi the Arghoon ruler hoarded grains, which he won't part at any cost, including his assassination by his own men.
 - The Little Ice Age also had hit the South-Asia and even Fatehpur Sikri the new Mughal capital, had to be abandoned in 1575 AD, as river water could no longer be lead to it.
- Amidst these troubles, Akbar conquered and annexed Sindh, but due to the Little Ice Age, food production was less than the need of population and Sindh tribes continued rebellion.
 - The Little Ice Age reached its worst by 1665 AD, when government revenues reduced to some 20% of what it was 65 years earlier.
 - In Sindh Little Ice Age receded by about 1700 AD.
 - In the northern Punjab it continued for another 50 years leading to Sikh rebellions.
 - Rebellions spread to the whole India and it brought end of Mughal Empire in early part of 18th century.
 - Little Ice Age continued up to 1850 AD in Europe.

The rise of Mughal Empire and its decline is associated with the Little Ice Age in the South-Asia i.e., 1525 to about 1700 AD.

Socio-economic Impact of the Little Ice Age and Civil War against Arghoon, Tarkhan and Mughals in Sindh 1525-1700 AD.

Consequences of Little Ice Age were; reduction in production, famine, starvation and death and this led to uprisings against Arghoons, Tarkhans and Mughals from 1525 – 1700 AD. The chaotic conditions forced migration of people from Sindh to Kutch, Kathiawar, Gujarat and Burhanpur. Many Sindhis also migrated to Jeddah, Mecca and Madina, where their decedents still call themselves Al-Sindhi. The people living in Sindh resorted to nomadic life and pastoral animal husbandry. Only the canals in the low lying area were flowing. Such areas were present in Jacobabad, Shikarpur, Larkana and Northern Dadu District. Hardly any canals were working on the left bank of the river and the whole area under the present Naushero Feroze, Nawabshah, Sanghar and Northern Hyderabad Districts was under rebellions led by the Samma tribes. The taxes were recovered only at the point of sword. Most of the canals were not cleared and had choked-up badly. In general production had reduced to half 1525 AD, level and so the population. At least half the population was in rebellion and during famine conditions at least on some occasions people resorted to cannibalism.

Rebellions against Arghoons, Tarkhans and Mughal Governors of Sindh (1525-1701 AD).

In an article entitled “Heroic Struggle of Sindh against Feudalism”, published in *Journal Sindh Quarterly* (1995), the present writer has described the circumstances under which chaotic conditions were created in Sindh, and economy destroyed during this period. To reflect these circumstances following are a few important incidents:

- Famines in Sindh were caused by the “Little Ice Age”, which had hit Sindh in 1525 AD. Famines had reached their first worst by about 1575-85 AD. It was at this time that Akbar abandoned his new capital Fatehpur Sikri. Akbar had introduced the Mansabdari system. Mansabdar a military governor, who collected land revenue and irrigation water charges; was also to impart justice, police to maintain law and order, de-silt canals and redistribute land. He was in fact a local despot, with unlimited powers and was responsible only to the Emperor.
- In 1634 AD, Yousif Meerak addressed an 800 page letter to Shah-i-Jehan, in which he gave details of bad administration of Mughal governors, negligence of canal system, rebellion of Sammas and other tribes. The rebellion amounting to civil war started from early Arghoon period and continued through to Shah Jehan’s days and is also reported by Beglar Nama, Tarkhan Nama, Tahiri, and records of East India Company (edited by Foster, who had a factory at Thatta between 1636-1662 AD). European travelers, namely Worthington, Manrique, Manucci and Hamilton and some of the letters from Aurangzeb white governor of Multan to his father (in *Ruq’at-i-Alamgir* and *Mukat-i-Alamgir*), confirm this.

Under such chaotic conditions irrigational system in Sindh went into rack and ruin. According to *Mazhar Shah-i-Jehani* many of governors, mansabdars, and allottees of lands by the crown, were unfamiliar with irrigated agriculture and the canals remained un-cleared. Tribes in rebellion turned outlaws and robbed those who cultivated lands. From the detailed accounts it appears that:

- At least half of the population was in rebellion. They resorted to animal husbandry on pastures, refusing to pay dues and attacked those who cultivated land and paid taxes.
- Taxes were recovered only at the point of sword.
- Most of the canals were not cleared, so they choked up.
- May fertile areas turned into desert.
- Due to decrease in irrigated area, the food production decreased and so did the population.
- There were famine conditions, such that at least on some occasions, people resorted to cannibalism.

By 1662 AD, area under irrigation as well as population of Sindh must have reduced to less than half of that 1525 AD. The income from Thatta Sarkar to the Central Treasury in 1665 was 20% as compared to 1600 AD, as per figures of Ain-i-Akbari and Bernier. From the revenues in 1665, it could be concluded that area under cultivation could not be more than 0.5 million acres and population not more than 1.0 million persons.

There are no records available after 1662 AD, but chaotic conditions increased so much that Mughal governor at Multan (who later on became Emperor Bahadur Shah-I), accepted a local tribal head (Panhwar by caste) to act as hereditary official governor for the present northern Dadu and southern Larkana districts. This arrangement lasted for many years as they had time to build religious and secular structures. They were finally removed without much struggle by Kalhoras, who had turned so powerful that they defeated an Imperial army in Dadu district and the Multan governor was compelled to accept them as official hereditary governors in the place of Panhwars. Panhwar tribe seem to have been settled by Soomeras or Sammas, on a small branch which the river Indus established from Radhan to Talti in the late Soomra or early Samma period. This branch dried up in the 16th century, but they were resettled on both banks of southern part of Western Nara i.e., Dadu, Johi and Sehwan Talukas by the Sammas. Having been accepted as local governors of Subedars in the later part of 17th century, they occupied lands in Kambar and Khairpur Nathan Shah Talukas too. Kambar-Warah Talukas had a branch canal operating up to 1931 called Panhwari. They also built a township at Ghari in Khairpur Nathan Shah Taluka. Kalhoras took away their possessions in these two Talukas, but Noor Muhammad Kalhora built a special canal called Noor Wah in Dadu Taluka to supply them water, supplementing Western Nara waters in Dadu, Johi and Sehwan Taluka.

Sammas who had legitimately fought against the conquerors for 175 years and had turned pastorals, did not have central leadership and were scattered, did not contest for the power as they had no central leaderships. It was during the chaotic conditions that

Kalhoras rose to in power replacing Panhwars in northern Dadu district. Kalhoras having being accepted as the tributary chiefs by Auranzeb's son Muizuddin in 1701 AD started occupying the rest of Sindh. Kalhora had put more than a century's struggle against Mughals. They were hereditary pirs and their followers were mostly Balochis D.G. Khan, Muzzafargarh, Sibi, and Kachhi. They also had Sindhi followers from north-western Sindh. They were master canal builders and constructed and renovated 700-1000 canals from 1701 to 1754 AD, as we will see here after.

Warming of Sindh Rise of Kalhoras to Power (1701-1758 AD).

Kalhora's rise to power is connected with Sindhi tribes struggle to acquire agricultural land, which, since 1525 AD, under Arghoons, Tarkhans and Mughal governors, had been allotted to the Jagirdars and Mansabdars, most of whom, according to Mazahar Shah-i-Jehani, were unfamiliar with agriculture as such, more so with the irrigated agriculture and construction as well as maintenance of canal system in Sindh. Majority of Sindh tribes had been under rebellion, and had resorted to animal husbandry based on pastoral economy. Only a few tribes and clans favorably placed for irrigation, such as these in Larkana and northern Dadu and Thatta districts, remained attached to irrigated agriculture. From the scattered references, it appears that some local tribal-heads, after the decline of power of Sehwan governor, had assumed the powers of local governors, and had improved irrigation system to some degree, but majority of the tribes yet remained aloof and did not participate.

Under the leadership of Kalhoras, who were one of the leading Pirs (hereditary Saints) and called them-selves Fakirs, the local tribes rose, defeated the Imperial troops, ousted their nominee tribal chiefs and in one stroke occupied present Larkana and northern Dadu districts and made Khudabad, a town of Panhwars, called Shikarpur as their capital. The Mughal governor of Multan the eldest son of Emperor Aurangzeb, as a compromise, accepted them as official governors. Kalhoras kept advancing season by season, and occupied more and more territories. By 1737 AD, they were masters of the whole of Sindh.

They were master builders. Their secret lay in quick construction of new canals or restoration of the old canal system and settlement of farmers on them. There are different estimates as to the area under cultivation in Sindh under Kalhoras. Lambrick thinks that they had achieved a figure of 3.0 million acres, while Chhblani (Economic History of Sindh) considers it as 2.1 million. The present writer accepts conservative estimate of 2.1 million acres as each acre of land needs and supports about 1.5 people in the rural community and Sindh's population could not have been more than 3.0 millions by about 1757 AD, when under Kalhora's cultivation reached its zenith. What canals did Kalhoras build? This is a matter which could be worked out only by considerable research. Sir Charles Napier's canal department had collected some records which soon were lost. No attempt was ever made to put this information together again.

On the basis of some information available, Kalhoras excavated the following canals:

- Shah ji Kur, constructed by Shah Buharo, Vazier of Noor Muhammad Kalhora.
- Nusrat Wah, excavated by Nusrat Khan Chandio in the days of Noor Muhammad Kalhora.
- Murad Wah Excavated by Murad Khan Kalhora.
- Feroz Wah excavated by Feroz Vir during Kalhora dynasty's rule.
- Sarfraz Wah excavated by Mian Sarfraz Kalhora.
- Bagwah, excavated by Bag of Sial clan, who were brought to Sindh from the Punjab by Kalhoras.
- Nur Wah from Begari canal excavated by and named after Noor Muhammad Kalhoro.
- Nur Wah from Ghar, excavated during Noor Muhammad Kalhora's rule.
- Nur Wah from Western Nara also excavated during Noor Muhammad Kalhora's rule, was in general perennial as was western Nara xcanal in its lower reaches, where it could supply water by gravity.
- Begari, as the name implies, excavated by statutory or forced labor may have been commissioned during early Kalhora rule, from which canal Noor Wah, and Sone Wah the two branch canals, took off.
- Shar Wah after tribe "Shar", now merged in Guddu Barrage as Sharkot branch.
- An unknown canal abandoned by Talpurs and renovated as Bridggs Wah.
- Rajab Chitti (Gath Wah).
- Maksuda Wah which one filled Sindh Dhoro and went in disuse under Talpurs, was commissioned by Jacob and called Jacob Wah. It was given final shape as Desert canal in 1873 AD.
- Sone Wah above mentioned from Begari.
- Mirza Wah.
- Grang Wah (which even today is an independent inundation canal taking off from the river Indus in northern Sindh).
- Ghar appears to be a natural drain, may have been commission by Kalhoras or it may even have been Abro canal of Samma period.

- Western Nara was natural branch of river Indus and was in commission during Kalhora-Talpur and British period.
- Date ji Kur (constructed by Dato Khuhawar).
- Shah ji Kur (constructed by Noor Muhammad Kalhoro).
- Naulakhi, Dad and Dhambhro, all old channels of river Indus, converted into canals by Kalhoras.
- Gungro, a natural branch of Indus, which may have been commissioned by Kalhoras after 1758 AD, when Indus took the present course below Hala.
- Baghar, a natural branch of Indus in 1699 AD, may have become a non-perennial stream after 1758 AD, and therefore may have been commissioned as canal by Mian Ghulam Shah Kalhoro.
- Same could be said of Ocho or Hajamro and Kalri canals.
- Three canals from Makhi Dhand, namely Mithrao, Din and Heran, which started operating, when Fife gave new mouth to Eastern Nara above Rohri, may have been old canals belonging to Samma-Soomra period and may have flowed occasionally as and when spill waters from the Indus and the Sutlej discharged into the Eastern Nara. They were probably in use occasionally during Ghulam Shah Kalhora's rule as he was the one, who took care that no spill water from Eastern Nara reached Kutch via Puran. Many of old canals belonging to Kalhora, Talpur and British period were absorbed in the new canal systems of Gudu, Sukkur and Kotri barrages. Only by extensive local investigation at the level of Sub-Divisional Engineers, could the antiquity and history of old canal system be ascertained. Unfortunately, this study does not have any engineering applicabilities, and so the department will have little use for it. It is hoped that some day economic and social historians and anthropologists would under take this study.
- Total number of canals under Kalhoras may have reached a figure of 700-1000.

Kalhora period's irrigated agriculture reached a minimum area of 2.1 million acres by 1757 AD. But a major hydrological change took place then. "Little Ice Age", warm climate and increase in river flows caused hydrological changes in the river Indus, around 1755/56 AD. The river re-established itself in its new course from Hala to west of Hyderabad and down, along its present channel, abandoning its old course, which went from Hala to Uderolal, Nasarpur, Shaikh Bhirki, Jun, Old Badin and Rahmaki to Kotri Creek in 1758 AD. This change left about 500 canals operative above Hala and an equal number was abandoned south of this place.

The area under irrigated agriculture in 1757 AD was 2.1 million acres, which was reduced to about 1.1 million acres by this change of river. Such major changes in Sindh have invariably caused fall of the governments and change of dynasties. The first rebellion was started by the Baloachi chiefs and was also supported by masses. Muradyab was replaced by Ghulam Shah as ruler.

Ghulam Shah's claim was challenged by Ahmedyar Khan and Attar Khan. The latter was able to obtain Sanad (authority to rule) from Ahmed Shah Durani and so Ghulam Shah vacated in his favor. Attar Khan could not manage the affairs, primarily as hydrological changes were still in process and the river had not fully established itself. The Baloachi chiefs therefore re-invited Ghulam Shah, who defeated his two brothers and they now withdrew, so he assumed the throne, un-challenged in 1759 AD, and settlement started on the new lands commandable by the new course of the river Indus. In normal times, such a process takes 50 years. To replenish the treasury, he launched a number of invasions, on Jam of Kakrala in 1760 AD, and Kutch (1761-62 AD, and again 1864/65 AD), conquering and annexing Kakrala, Sindhuri (in Rann of Kutch submerged destroyed in earthquake of 1819 AD), Lakhpatt and Basta and thus bringing large area of the Rann of Kutch under his control. In the meantime, internal feuds held Kalhoras in their grip for the next 25 years, when this dynasty was replaced by Talpurs. The British historians seem to have had great regard for the canal management of Kalhoras and even as late as 1937 AD, Lambrick (Jour. Sindh Historical society, 1937), stated that by 1930 within 87 years of their rule, the British had just achieved what Kalhoras had already done by the mid 18th century.

By 1757 AD. Even if Lambrick's figure of 3.0 million irrigated acres is replaced by Chhablani's conservative estimate of 2.1 million acres, Sindh's population would be about 3.0 million (Chhablani thinks that near about 1600 AD, area under cultivation in Sindh was 1.3 million acres, which in accordance with rate of taxation, yield per acre and price of grain, fetched the government of the day, 66, 215, 395 Dams, as reported in Ain-i-Akbari). This would put Sindh's population at 1.9 millions souls in 1600 AD. Under Aurangzeb considering also the fact that Revenue from Thatta Sarkar in 1665 was 20% of that in 1600 AD, the area under cultivation in Sindh must have further reduced to about 0.5 million acres. It is fair to assume that before Kalhora's dynasty gained power in Sindh in 1701 AD, its population thus could not have been more than 1.2 millions and area under cultivation 0.7 million acres. To Kalhoras therefore goes the credit of almost tripling the population as well as the area under cultivation.

Again knowing the circumstances between 1525 and 1701 AD, it could be stated that under Sammas total population may even have been 2.5 million and the area under cultivation 1.6 millions, though conservative figures of 1.6 millions. In the intervening 175 years, not only Sindh's area under cultivation reduced but also the population. The same was to repeat between 1758 AD, due to prevalence's of cold spell or continuation of the Little Ice Age up to 1850 AD.

Change of Course of the River Indus and Decline of Kalhora Power in Sindh (1758-1783 AD).

The change in the course of river Indus in 1758 AD brought down the canals cultivation from 2.1 millions to 1.1 millions acres. Simultaneously cold prevail again specially after 1760 AD, and in spite of 15 years efforts of Kalhoras up to 1776 AD, the area under cultivation could not be increased substantially. It then became apparent that with the food production would reduce to half, the population will also reduce to half and this would lead to starvation, diseases and deaths. It thus resulted into struggle for existence. The Kalhora rulers felt that Baloachi tribes brought by them and settled as jagirdars were too powerful for them and tried to crush their power. The Baloach tribes on other hand saw that they could save their kith and kin from starvation, if they could usurp most of the land. It was a case of Darwin's "Struggle for Existence". It really was a civil war, which had its origins in replacement of Mian Muradyab Khan with Ghulam Shah and now resulted into open fight with the rulers, who also used various tactics including invitation to Madad Khan, who in turn looted the whole Sindh to crush the power of Baloachi chiefs. In the final round Talpur ousted out the Kalhoras and distributed most of the lands among themselves. Some Zamindars were allowed to retain the land on payment of tax. The population which in 1758 AD, was about 3.0 million. It reduced to 1.4 millions as British saw in 1843 AD. The British blame Talpur for mismanagement of irrigation system. This allegation is hardly true because the levels of water in the river due to cold spell, which continued up to 1850 AD, were so low that Kalhora canals which were 6 yards wide had reduced to 1/3rd of their width. Kalhora's increasing area under cultivation, was on account of high level of water in the river Indus, and this had acted as incentive to increase the area under cultivation. The initiative comes essentially from the cultivators who volunteered his labor, to dig and de-silt the canals so that he is able to switch from nomadic pastoral economy to settled agricultural one. This incentive was absent during the Talpur rule. Mirs did construct canals South of Hala and there is no doubt that they contributed towards irrigation, within the means i.e., availability of water and its level in the Indus. In the whole process of Kalhora-Talpur strife the party that suffered the most was the cultivator, who no longer had water available for his land and turned to pastoralism and gradually succumbed to death, as adequate pasture was not available. In reduction of population from 3.0 millions to 1.4 millions, it was he who faced death and starvation, as an area under cultivation reduced from 2.1 million acres to 0.9 million acres. Hari was a back-bone of irrigated agriculture in Sindh and he had invariably suffered by climatic hazards during the past eight millenniums.

In brief neither Kalhoras nor Talpurs are to be blamed for what happened. It was case of struggle for existence and the fittest of the parties had to survive under the conditions, where every second person was to die of starvation, as the cultivated area was reduced to half by the change of course in the river Indus and cold spell had prevailed from 1758-1850 AD, in which river levels were low, canals did not flow full and area under cultivation had reduced to half of that in 1758 AD. ***In Brief when every second person is to die there is no mortality who kills whom. This is the rule of "Struggle for existence and survival of the fittest." I blame neither Kalhoras nor Talpurs for the massacres. Both stand equally exonerated.***

[This article is extracted from the author's book, "Changing Climates of Sindh and its Impact on History; 16,000 BC, to the Present Times", now ready for the press.]