* THE ENVIRONMENTS THAT LED TO THE RISE AND FALL OF KALHORAS

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INTRODUCTION

My definition of the 'History' is that it is the history of production, it is a history of the means of production, it is a history of control over the means of production and 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. It 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 led to famines, starvation, deaths and change of dynasties with each such castrophy. The Indus plains have supported as much as 80% population of Sindh. The fluctuations in the level of river Indus are governed by snow melts 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

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canals flow full and area under cultivation is increased. The level of water in the Indus is also governed by the rains in the catchment 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 Himalaya's 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 cannot 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; Khatris (Kings) 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 production among the whole population not according to their contribution, but according to their ability to buy. Vaish (Traders and businessmen) to cultivate the land and to trade the various items of production and finally Shudra (the artisans) who produce goods and services for the use of the above three communities as well as for themselves. The caste system probably originated during the Early Indus Civilisation and was adopted by the people who professed the Aryan religion many a millenia 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 became negative.

WARM CLIMATE AND RISE OF CIVILISATION IN SINDH 7500-2000 B.C.

Climate of Sindh has never remained the same and so has the prosperity. From 7,500-2,000 B.C., 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, etc.) on preserved moisture. The prosperity of raising crops led to the rise up Mehrgarh (6500 B.C.), Amri (3700 B.C.), Kot Diji (3,300 B.C.) and Mohen-jo-Daro (2350-1650 B.C.), an un-interrupted civilisation 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 CIVILISATION (2000-900 B.C.).

The climate started changing to ardity around 2,000 B.C., and around 2,000 B.C. It became bad enough to bring an end to Harappa in 1,750 B.C., and Mohen-jo-Daro in 1,650 B.C. The Mohen-jo-Darians 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 B.C., and the culture further disintegrated. This lasted

up to 900 B.C., 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 B.C.).

After 900 B.C., 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 B.C., to about 300 B.C. 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 B.C., the seven principalities namely; Malloi, Oxydrades, Musicanus, Sambus, Oxycanus, Moeres-I and 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 B.C. - 365 A.D.)

The aridity prevailed again to various degrees up to about 400 A.D. 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, Sycthians, Parthians, Kushans and finally Sassanians of Iran. Their occupation became oppressive accompanied by

local rebellions and they left few monuments in Sindh. Under them no Buddhist stupas worth the name were constructed in Sindh. [Ref. Chronological Dictionary of Sindh, pp.84-108].

WARM WET PERIOD AND BUDDHIST GLORY 400-700 A.D.

From 400-700 A.D., 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 A.D., though he himself was killed; Rai Sehasi-II repelled Harasaha between 620-630 A.D., and Brahmans under Dhahar repelled 14 attacks of Arabs. Almost, all major Buddhist stupas have been built during these 300 years of Sindh's prosperity brought by favourable 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 A.D., 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 A.D., onwards. Around 700 A.D., 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 A.D., in a period of 140 years, Ummayyids and Abbasides respectively sent 11 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 Governor's unfamiliarity with the canal irrigation as practised 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 50% of the governors were dismissed by Damascus and Baghdad for their inefficiency to control rebellions, 25% were killed in action in local wars and only 25% returned back alive (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 led to take-over by Habaris of the Arab descent, who had been naturalised 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.

CLIMATE OPTIMUM (WARMEST CLIMATE 900-1250 A.D.)

The period 900-1250 A.D., is considered as "Climatic Optimum", in the whole world. With more rainfall and high water levels in the river, the canals in Sindh flowed full. Sindh prospered. A large number of Arab travellers 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 A.D., Habaris were replaced by Soomras, probably their close kith and kin. From 900-1250 A.D., the area under cultivation may have been 2.0 million acres and population over 3.0 million people, as Thar and Kohistan could support twice the population as they do

now.

This climatic optimum became over by about 1250 A.D., or the latest by 1300 A.D., and troubles started for Soomras (1011 - 1333 A.D.). [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, black-smiths, pottery-makers, hair-dressers, brick-layers, masons, painters, etc. They usurped their lands, because canals could not irrigate all the land as they did during the "Climatic Optimum".

MILD CLIMATE 1300-1525 A.D. AND THE SAMMA RULE

Under Sammas (1333-1525 A.D.), 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 stabilise 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 Tughlaks 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 Abbaside Khilafat; 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 A.D.)

Little Ice Age was a coldest period in the whole world from 1480-1850 A.D., within past 10,000 years. It started in Europe and Northern America sufficiently early and in the Central Asia around 1500 A.D., causing aridity, starvation and movement of tribes for fertile lands in the irrigated river valleys. There were attempts to conquer Sindh after 1490 A.D., 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 Turkhans to vacate Qandhar. The latter had no option but to invade Sindh, to conquer and to save their clans form starvation. Even for Babar environmental conditions were too severe to sustain himself in Samarkand and he successfully captured Delhi in 1526 A.D., one year after Shah Beg's conquest of Sindh (That Shah Beg conquered in 1519 A.D., is a mistake of Masumi). For Arghoons and Turkhans there was no alternative but to 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 A.D. These were felt in the Central Asia around 1480 A.D., first, but the situation started worsening there after 1500

A.D., leading to migration of the Central Asian tribes, to the Sub-continent from 1520 to 1660 A.D. The process as applied to Sindh can be explained as under.

If temperatures in the plains of the sub-continent dropped by 0.5°C and Himalayas by 1.0°C, the effect as compared to the normal year, for example say 1930 A.D., shall be:

* Snow which normally starts melting 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 of 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 of July.

* The level of water in the Indus will be lower then 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 form 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 Ratrhio, 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 A.D. The temperatures kept decreasing and so the agricultural production. Local rebellions started and they could not be crushed until end of Arghoon - Turkhan rule of Sindh in 1591 A.D. They further continued undered the Mughal Governors.

- By about 1578 Sindh had worst famines lasting for some 7 years. Mirza Baqi the Arghoon ruler hoarded grains, which he wont part at any cost, including his assassination by his own men.

- The Little Ice also had hit the Indian Sub-continent and even Fatehpur - Sikri the new Mughal capital, had to be abandoned in 1575 A.D., as river water could no longer be led 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 A.D., when government revenues reduced to some 20% of what it was 65 years earlier.

* In Sindh Little Ice Age receded by about 1700 A.D.

* 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 in Europe.

The rise of Mughal Empire and its decline is associated with the Little Ice Age in the South-Asia from 1525 to about 1700 A.D.

SOCIO-ECONOMIC IMPACT OF THE LITTLE ICE AGE AND CIVIL WAR AGAINST ARGHOON, TURKHAN AND MUGHALS IN SINDH 1525-1700 A.D.

Consequences of Little Ice Age were; reduction in production, famine, starvation and death and this led to uprisings against Arghoons, Turkhans and Mughals from 1525-1700 A.D. The chaotic conditions forced migration of people from Sindh to Kutch, Kathiawar, Gujarat and Burhanpur. Many Sindhis also migrated to Jedda, Mecca and Madina, where their decedents still call themselves Al-Sindhi. The people living in Sindh resorted into nomadic life and pastoral animal husbandry. Only the canals in the low lying areas 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 Feroz, 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 A.D. level and so the population. Atleast half the population was in rebillion and during famine conditions and on some occasions people resorted to cannibalism.

REBELLIONS AGAINST ARGHOONS, TURKHANS AND MUGHAL GOVERNORS OF SINDH (1525-1701 A.D.)

In article entitled "Heroic struggle of Sindh against fuedalism", 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 caused by the "Little Ice Age", had reached their first worst by about 1575-85 A.D. Akbar had introduced 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, desilt canals and redistribute land. He was infact a local despot, with unlimited powers and was responsible only to the Emperor.

* In 1634 A.D., 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, Turkhan Nama, Tahiri, and records of East India Company (edited by Foster, who had a factory at Thatta between 1636-1662 A.D.). Europeans travellers, namely Worthington, Manrique, Manucci and Hamilton and some of the letters from Aurangzeb while governor of Multan to his father (in Ruq'at-i-Alamgir and Mukati-Alamgir), confirm this.

Under such chaotic conditions irrigational system in Sindh went into rack and ruin. According to Mazahar Shah-i-Jehani many of governors, mansabdars, and allottees of lands by the crown, were unfamiliar with irrigated agriculture and the canals remained uncleared. 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 chocked up.

* Many 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 A.D., area under irrigation as well as

population of Sindh must have reduced to less than half of that in 1525 A.D. The income form Thatta Sarkar to the Central Treasury in 1665 A.D. was 20% as compared to 1600 A.D., as per figures of Ain-i-Akbari and Bernier. From the revenues in 1665 A.D., 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 A.D., 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 Soomras 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 re-settled 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 or 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 A.D. 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 leadership. It was during the chaotic conditions that Kalhoras rose to in power replacing Panhwars in northern Dadu district. Kalhoras having been accepted as the tributary chiefs by Auranzeb's son Muizuddin in 1701 A.D., started occupying the rest of Sindh. Kalhoras had put more than a century's struggle against Mughals. They were hereditary pirs and their followers were mostly Balochs from 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 A.D., as we will see here after.

WARMING OF SINDH AND RISE OF KALHORAS TO POWER (1701-1758 A.D.)

Kalhora's rise to power is connected with Sindhi tribes struggle to acquire agricultural land, which, since 1525 A.D., under Arghoons, Turkhans and Mughal governors, had been allotted to the Jagirdars and Munsabdars, most of whom, according to Mazhar 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 favourably 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 themselves 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 1837 A.D., 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 Chhablani (Economic History of Sindh) considers it as 2.1 millions. The present writer accepts conservative estimate of 2.1 million acres as each acre of land needs and supports about 1.5 persons in the rural community and Sindh's population could not have been more than 3.0 millions by about 1757 A.D., 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:

* Sir 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 Kalhoro.
* Feroz Wah excavated by Feroz Vir during Kalhora dynasty's rule.
* Sarfraz Wah excavated by Mian Sarfraz Kalhoro.
* Bagwah, excavated by Bag of Sial clan, who were brought to Sindh from the Punjab by Kalhoras.
* Noor Wah form Begari canal, excavated by and named after Noor Muhammad Kalhoro.
* Nur Wah from Ghar, excavated during Noor Muhammad Kalhoro's rule.
* Noor Wah form Western Nara also excavated during Noor Muhammad Kalhoro's rule, was in general perennial as was Western Nara canal in its lower reaches, where it could supply water by gravity.
* Begari, as the name implies, excavated by statutory or forced labour 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 Gudu Barrage as Sharkot branch.

* An unknown canal, abandoned by Talpurs and renovated as Briggs Wah.

* Rajab Chitti (Gath Wah).

* Maksuda Wah which once filled Sindh Dhoro and went in dis-use under Talpurs, was commissioned by Jacob and called Jacob Wah. It was given final shape as Desert canal in 1873 A.D.

* 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 commissioned 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 A.D., when Indus took the present course below Hala.

* Baghar, a natural branch of Indus in 1699 A.D., may have become a non-perennial stream after 1758 A.D., and therefore may have been commissioned as canal by Mian Ghulam Shah Kalhoro.

* Same could be said of Ochto 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 investigations 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 applications, and so the department will have little use for it. It is hoped that some day economic and social historians and authropologists 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 A.D. 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 A.D. 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 Bhirkio, Jun, Old Badin and Rahmaki to Kori Creek in 1758 A.D. 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 A.D., 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 Balochi 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 favour. Attar Khan could not manage the affairs, primarily as hydrological changes were still in process and the river had not fully established itself. The Balochi chiefs therefore re-invited Ghulam Shah, who defeated his two brothers and they now withdrew, so he assumed the throne, unchallenged in 1759 A.D., 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 A.D., and Kutch (1761-62 A.D., and again 1864/65 A.D.), conquering and annexing Kakrala, Sindhuri (in Rann of Kutch submerged destroyed in earthquake of 1819 A.D.), Lakhpat 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 A.D., 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 A.D. 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 A.D., area under cultivation in Sindh was 1.3 million, 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 Sindhs population at 1.9 millions souls in 1600 A.D. Under Aurangzeb considering also the fact that to Revenue from Thatta Sarkar in 1665 was 20% of that in 1600 A.D., 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 A.D., 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 A.D., it could be stated that under Sammas total population might have been 2.5 million and the area under cultivation 1.6 millions, even 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 A.D., due to prevalances of cold spell or continuation of the 'Little Ice Age' up to 1850 A.D.

CHANGE OF COURSE OF THE RIVER INDUS AND DECLINE OF KALHORA POWER IN SINDH (1758-1783 A.D.)

The change in the course of river Indus in 1758 A.D., brought down the canals cultivation from 2.1 millions to 1.1 millions acres. Simultaneously cold prevailed again specially after 1760 A.D., and in spite of 15 years efforts of Kalhoras upto 1776 A.D., the area under cultivation could not 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 stravation, diseases and deaths. It thus resulted into struggle for existence. The Kalhora rulers felt that Balochi tribes brought by them and settled as Jagirdars were too powerful for them and tried to crush their power. The Baloch 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 it 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 of Sindh to crush the power of Balochi chiefs. In the final round Talpurs 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 A.D., was about 3.0 millions was reduced to 1.4 millions as British saw in 1843 A.D. The British blame Talpurs for mismanagement of irrigation systems. This allegation is hardly true because the levels of water in the river due to cold spell, which continued upto 1850 A.D., 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 came essentially from the cultivators, who volunteered their labour, to dig and de-silt the canals so that they are 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 the area under cultivation reduced from 2.1 millions 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 milleniums.

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 A.D., in which river levels were low, canals did not flow full and area under cultivation had reduced to half of that in 1758 A.D. IN BRIEF WHEN EVERY SECOND PERSON IS TO DIE, THERE IS NO MORALITY 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.

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Source "The Consequences of Change of Course of the Indus" is extracted from the author's book, "Changing Climates of Sindh and its Impact on History; 16,000 B.C., to the Present Times".