Some Land Use Innovations in the Lower Indus Valley[1]

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The lower Indus valley and delta, or the Province of Sind, has long been characterized as the "unhappy valley".[2] Agriculture has been carried on in the area for thousands of years, but it has been a gamble — more of a gamble than normal in this risky undertaking. Irrigation is necessary for anything approaching reliable agricultural production although dry planting of millet persists in some areas inaccessible to irrigation systems.

For most of history, the irrigation practiced in Sind was of the inundation type (Fig. 1). Canals flowed if the Indus rose high enough, and there was no way to prevent flooding if the river flood was above "normal". Within the last 50 years, however, three huge barrages with their canal systems have been constructed to bring the river under control and management, but water problems have by no means been overcome.[3]

The twin menaces of waterlogging and salinity have seriously affected parts of the area, they still threaten to spread. Furthermore, Sind's downstream location within the Indus drainage basin does not facilitate optimum water management. The massive facilities developed for the control of the water resources of the entire Indus valley have not yet succeeded in preventing deficits of water supply at times and surpluses at others. A drought in the watershed caused damaging shortages in 1971 – 72, and flooding occurred in 1973.

The agricultural specialities of Sind have long been cotton — the principal commercial crop —, wheat and rice — the basic food grains —, and supplementary food and fodder crops such as millet,

Fig. 1

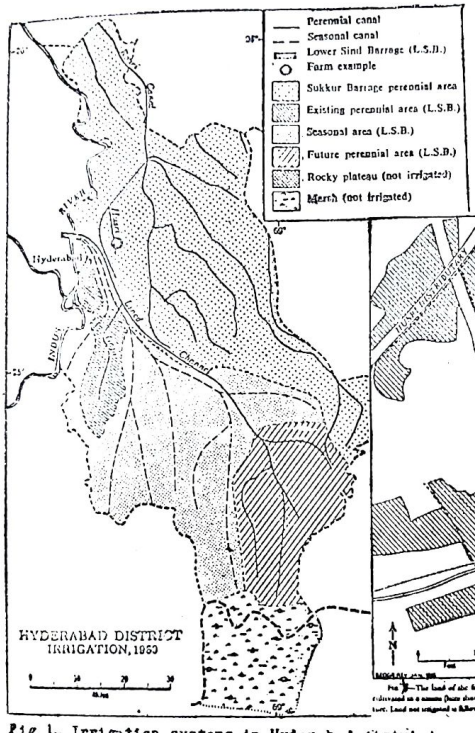


Fig. 2

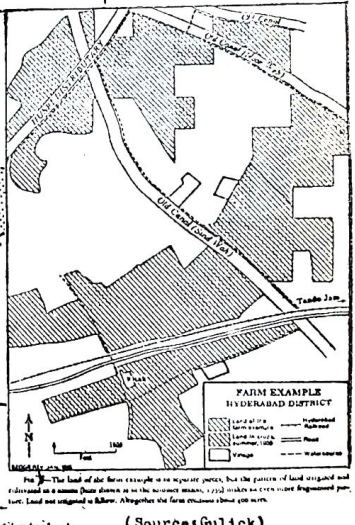


Fig. 1 Irrigation systems in Hyderabad District, 1960. The entire Sukkur Barrage area in this district is served by one large canal, the Rohri Canal. In the Lower Sind Barrage area canals are still being constructed and modified since the completion of the dam in 1955.

(Source: Gulick)

(Source: Gulick, op. cit., pp. 86-7)

sorghum and gram. Limited areas are now provided with seasonal supplies of water for rice, whereas larger areas are provided with perennial supplies designed to permit "dry" crops to be grown in a relatively extensive system of irrigation. The "dry" crops, cotton and wheat for example, require much less water than rice. Irrigation plans also called for the perennially watered areas to be left fallow at least a quarter to a third of the time. Crop statistics over the last 40 years reflect the expansion of land producing these crops and some readjustment of crop concentrations as the new canals were put into operation.

It is not the intention at this time, however, to discuss the major crop trends, but rather to indicate some of the new crop and livestock developments which are not readily documented in available materials. At the present time it is not possible to assess the impact of these changes; they may be harbingers of the future, or they may be quite ephemeral. Nevertheless, it is important to call such developments to the attention of those interested in Pakistan and irrigated agriculture so that productive trends will be recognized and, possibly, encouraged, rather than being hidden in statistical summaries or perceived to be minor aberrations, or even mistakes, in the data gathering process.

The changes to be reported upon involve new emphasis upon livestock operations, expanded interest in tree crops, and the adoption of several new techniques. To illustrate the potential for increased emphasis upon livestock, a farm which has shifted from the normal cotton-wheat combination to a mixed dairy farm is described. The increasing interest in horticulture is illustrated by the expansion of mango production and the introduction of limes as a commercial tree crop. As for technological changes, the use of siphons to water fields and intercropping are practices which could help intensify and improve the use of land and water.

A Shift to Dairy Farming

The first example involves a farm that was a relatively typical cotton-wheat farm when it was studied in 1959 – 60 (Fig. 2).[4] Since then it has become a dairy and mixed crop farm serving the Hyder-

abad city market. Increased land use diversification has accompanied this shift.

The farm includes almost 400 acres and has been in the same family for many generations. Prior to the 1930's its water came from inundation canals which here, at a distance of 12 miles from the Indus, flowed below the level of the land. In those days Persian wheels were used to lift the water to the cultivated fields and a much smaller proportion of the land was cropped each year. At present water is supplied by gravity from one of the perennial canals leading from the Sukkur Barrage. In 1959 – 60 cotton was raised on 58 acres in the summer season and wheat on 64 acres in the winter. Other crops such as millet, sorghum, some maize, and berseem as fodder, and vegetables (carrots and tomatoes) and fruit (mangoes) occupied lesser acreages. All in all about a third of the land was used in the summer season, a third in winter, a small amount was in year-round use (orchards, berseem); and a fourth was fallow throughout the year. The water supply was not intended to be sufficient for a much higher rate of land use than this.

In 1960 much of the land was cultivated and managed by haris, or sharecroppers, with their own bullock teams. This was and is the typical land management pattern of Sind. The larger the landowner's holdings, the more haris he engages. The hari has no land but he owns the valuable draft power. The major crops produced are divided between the two, and the hari also gets land on which to locate his home and from which to feed his bullocks.

Even in 1959 – 60 there were some relatively unique aspects of this farm. Commercial crops, mainly vegetables, were being raised in addition to the usual cotton. Relatively easy access to the city markets of Hyderabad five miles away made this a logical emphasis, but this farm owner was more interested than most of his neighbors. A further contrast was that this landowner had already assumed direct management of about half of his land in 1960. This meant that he himself owned ten bullock teams which he used for cultivation under his immediate supervision. In addition to the work animals, the farm contained numerous and varied other animals kept by hari and land owner. Each hari family typically owned a milk buffalo,

a sheep or goat and some chickens. The common pattern was for the landowner to have several horses and enough buffaloes or cows for his extended family's milk/ghee supply, and some goats, sheep and chickens, also for home supply. Even in 1959 – 60, however, this landowner had a herd of 25 buffaloes and 2 cows; and some milk sales were made.

By 1971 – 72, the dairy aspect of this farm had been greatly expanded; less emphasis was placed on vegetable production; wheat was reduced in acreage, though still a major crop; cotton acreage was up; and acreage in fodder crops, partially associated with the dairying, had been increased. Rather than the cotton-wheat farm of 1959 – 60, it had become a dairy and mixed crop farm. A new commercial crop of considerable value also added was sugar cane, and an enlarged mango orchard was being developed. Various other changes occurred as this transition took place. From 1960 until 1966, the acreage cultivated was increased, but since then water has been less available and in 1971 – 72 even more land was fallow (35% compared to 26%) than was true in 1960. At least two factors help explain this. By 1966 much more land on this farm was being irrigated than the canal system in this area was designed to make possible. After 1966, allocations were held more closely in line with canal design plans. Then, in the years 1970 – 71 and 1971 – 72, general water shortages due to unprecedented droughts in the upper Indus catchment area led to a reduction of allocations by half as a temporary crisis measure. Tube wells in this area are not useful since the ground water is too brackish.

By 1972 the dairy herd was up to 100 buffaloes and the production of fodder normally occupied half of the land cultivated. Fifteen laborers were employed permanently and engaged in livestock care and milking, and fodder planting, cutting and chopping. This was the single most important farm activity in terms of income and land use. The total income from the cotton, wheat, sugar cane and miscellaneous other crops would, however, still exceed that from milk sales alone. (Miscellaneous other crops include some carrots, tomatoes, roses, some fodder on occasion, and mangoes).

This farm was even more unusual in that the operation in 1972 made no use of the traditional share-cropping system. There are no

more haris; rather there are the 15 permanent wage laborers, and an average of 25 – 30 others hired for special jobs when work on the crops must be done. The owner himself had 22 bullock teams to assist with the field work. At harvest time over a hundred agricultural laborers were employed. Some of the commercial crops, such as sugar cane for fresh sale, were sold in the field to contractors who paid a flat fee and handled the harvesting and transporting.

One of the reasons that haris are no longer used is that when water became short after 1966 squabbles with haris became very difficult; the owner is glad to have the current arrangement. From the haris' viewpoint their change to the status of agricultural laborer is ordinarily seen as a loss, but those farm managers who have ideas about improved use of land they control are unanimous in seeing the hari system as an obstacle to innovation and experimentation.

This farm, in conclusion, is an illustration of one that has adopted a variety of new emphases, with a major stress on dairying. In the process of change, the farm has also become a very diversified operation. It has become a more commercially oriented enterprise, one which can vary its production in light of market and water conditions. At the same time, the farm does support a large number of workers, although in individual cases workers are not as secure as they formerly were as haris with their semi-subsistence form of livelihood. On the other hand, the changes which have taken place and the flexibility indicated by the diversity of crops grown could not have been accomplished under the traditional farm pattern in which haris were allowed to decide what crops were to be raised.

The Shift to Horticulture

An example of the new emphasis upon tree crops is the case of a large landowner who placed 350 acres of land under the management of a trained horticulturist. The manager promised to increase the income from the land several fold by converting the farm into a large mango and lime orchard.

Prior to 1965 the land was managed by the traditional techniques. Fifteen or sixteen sharecropping families cultivated about 15 acres each, half in cotton in the summer and the rest in winter wheat.

One-third of the total farm acreage was left fallow the year round. Yields were low and the owner took no direct hand in the operation except to collect his share from the wheat and cotton. Since then a great deal of investment in the land has been undertaken and the returns to the management have reportedly increased ten times. The owner has agreed to take a 3 to 4 fold increase and to allow the manager to reinvest the remainder in the land. A twenty-acre banana plot has been established in order to get a high return while the new mango and lime orchards are being planted.

The first orchard areas started to produce in 1972. Meanwhile cotton and wheat were still being grown on 75 to 100 acres of the land. Mangoes and limes had been set out on 60 and 55 acres respectively in 1972. Before they were planted the land was carefully levelled, farm roads were put in, and windbreaks planted. To supplement the canal water, three tube wells have been completed and farm water courses rearranged so that the canal water can be combined with well water as needed. The spaces between newly planted orchard trees are used for crops at least during the first four years of their growth. Crops planted in such places include cotton and wheat, but also berseem, beans, potatoes, onions and chillies. Careful attention is paid to fertilizing and watering all the crops, as well as to insect control.

In the process of achieving these changes the haris here also have been converted to wage laborers. In many cases they have been trained to become skilled farm workers familiar with the techniques being applied. Two tractors are in use as well as the bullock teams of the former haris. There are now 30 full-time laborers, more than were previously engaged as haris. The manager has not only taught them skills, but he has helped them get better drinking water, a more balanced diet, and health care. The especially skilled workers are rewarded by having small acreages available for their own use so that they can apply their training to land they manage themselves. A problem which has developed is that such workers are beginning to be offered higher wages to apply some of their skills on the farms of other landowners. The farm manager has attempted to counteract this move by offering to train other landowners' employees for them if they will assign them to him for several months

to half a year. He has started a work-study program.

As a result of the improved practices and improved water supply, the returns from the land have already increased so that future development can be financed from the income derived from the farm. This has happened even before the orchards themselves are in full production. It will be 1982 before the entire area is in producing orchard. The manager expects even more phenomenal returns by that time.

It is too early to be able to say how successful this farm will be as a large orchard. The market for mangoes will, of course, be influenced by the general state of Pakistan's economy. The same can be said of limes. Nevertheless, it would not be too unrealistic to predict a successful future for these products, although there undoubtedly will be disappointing years. The Persian Gulf nations and, perhaps, the USSR should offer good market opportunities over and above those within Pakistan itself.[5]

Quite clearly what has been demonstrated on this farm, so far, is the potential of the land and workers to respond to skilled management, whether growing orchard crops or not. Indeed, both of the above examples go far toward illustrating that the lands of Sind have a potential for varied and quite productive use.

References

1. This is a revision of a paper given at the 71st Annual Meeting of the Association of American Geographers held in Milwaukee, Wisconsin, USA on April 20 – 23, 1975.
2. R. H. Burton, *Scinde or the Unhappy Valley* (No publisher given, 1851), title.
3. L. H. Gulick, Jr., "Irrigation Systems of the Former Sind Province, West Pakistan," *The Geographical Review*, Vol. LIII, No. 1, 1963, pp. 79 – 99.
4. L. H. Gulick, Jr., "A Cotton-Wheat Farm in Hyderabad District, West Pakistan," *Pakistan Geographical Review*, Vol. 16, January, 1961, pp. 25 – 34.
5. The horticultural experiment is being copied by one of the manager's friends who has only 16 acres. He has some outside resources to invest in the enterprise and he foresees the time when he will be fully supported by his farm.