

Water charging in Sindh, Pakistan – financing large canal systems

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1. Introduction

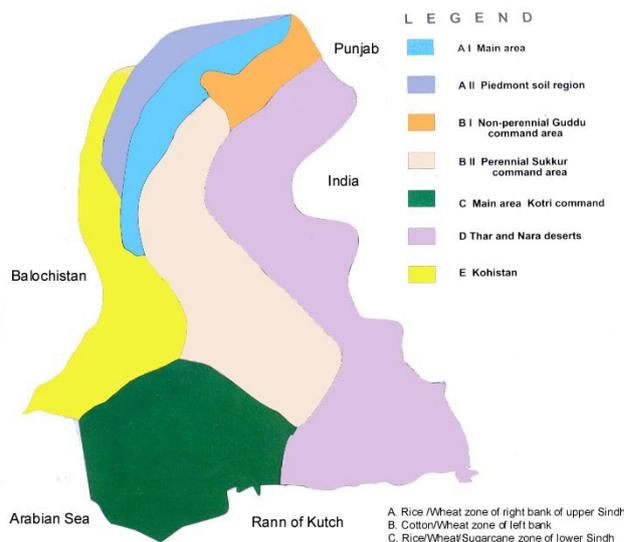
The Sindh Irrigation System is part of the Indus Basin irrigation system, the world’s largest irrigation system. The size of the system is enormous by any standard. The area in the Province irrigated by the fourteen main canals from the three barrages on the Indus River is 5 M ha. To give a measure of the size of the irrigated system in the Province of Sindh: it is one and half times the irrigated area in Mexico and more than the area under irrigation in Egypt.

Figure 1: Sindh

Water charging issues in Sindh are comparable to water charging issues in other mega canal systems in India and Pakistan: low water rates, problematic recovery and chronic under funding. The experience of Sindh is also of interest because in the last three years a number of steps have been taken to reform the irrigation system with implications for the water charging system. The reforms in fact were motivated by the growing awareness that it was no longer possible to fund irrigation services at the level that the importance of the sector warrants in Sindh.



The economy of Sindh is very dualistic. On the one hand there is Karachi City, which takes care of nearly 40% of the population of Sindh and is the economic powerhouse of the entire country. The rural area on the other hand is predominantly agricultural. Most poverty in Sindh is also rural – with the population below poverty line touching 35% in 1999. Sindh’s rural poverty has often been associated by the very large inequity in land distribution. Large farm holdings – cultivated with the help of tenants, land labourers and mechanized equipment – are the norm. Only 33% of the farms are officially classified as ‘small’, meaning their size is less than 8 ha.



Agriculture is almost entirely irrigated with the exception of limited areas under spate irrigation in the Western part of the Province and rainfed agriculture in the Tharpakar Desert. Major crops are wheat, rice and cotton (see figure 2) – but yields are below what they are elsewhere in the world. High value horticulture is still limited to mango orchards. Over the last fifteen years agricultural production in Sindh has increased – but more or less at the pace of population increase, i.e. at 2-3% a year.

Figure 2: Agro-ecological zones of Sindh. Source: PARC.

Table 1: Main crops and yields in Sindh

CROPS	AREA "000" HECTARES		PRODUCTION "000" M. TONS	
	<u>1998-99</u>	<u>1999-2000</u>	<u>1998-99</u>	<u>1999-2000</u>
MAJOR CROPS				
Wheat	1,123.7	1,144.2	2,675.1	3,001.3
Rice	704.1	690.4	1,930.3	2,123.0
Sugarcane	270.8	230.6	17,050.7	14,290.8
Cotton ("000" Bales)	630.2	633.5	2,134.1	2,377.4
Sorghum	110.3	91.1	64.4	55.9
Bajra	175.0	18.0	73.1	8.9
Maize	10.5	8.6	5.5	4.6
Rape Seed & Mustard	92.4	77.6	73.6	63.9
Gram	89.8	86.4	76.7	70.4

2. The irrigation system

The irrigation system in Sindh is entirely supplied by three major barrages on the Indus River (Guddu, Sukkur and Kotri). They feed 14 main canals – the larger ones of which split into branch canals. The size of the system in Sindh is clear from the size of the two largest canals in the Province, i.e. Rohri and Nara both of which serve a command area close to one million hectare, making them among the largest single canals in the world (see table 2). The canals then distribute the water in distributary canals and minors from head regulators. Each distributary and minor supplies water to water courses. A typical distributary provides water to some 15 to 30 watercourses – but large distributaries serve more than 100 watercourses. In some areas pumps are used to lift water from the canals. There are both government-owned pumping stations and private pumps, some of which are legalized now, but others still have an informal status.

Of the main canals some are officially designated as perennial, whereas others are non-perennial. The perennial supplies are supposed to get year-round supplies (with the exception of the canal maintenance period in January). The other canals in principle get larger supplies, but only in the winter season. The background of the system of non-perennial canals is that they are supplied in the winter only, when the flow in the Indus is high. In reality non-perennial canals receive year-round irrigation as well, particularly after the completion of the upstream Tarbela Dam, which regulated the flows in the Indus. The water allocations both for main canals and distributaries/ minors have never been formally adjusted after this major intervention in the water control system.

The major exception to this neat picture of barrage – canal – distributary – water course are the direct outlets. These are watercourses that are directly connected to the main canals. They are very popular with the landowners served by them – because being directly on the main canal virtually assures unhampered supply – but they play havoc with the water control system. On the Nara canal for instance direct outlets have proliferated. They now serve nearly 29% of the command area up from less than 5% of the time of system commissioning in 1932. Direct outlets make it very difficult to control canal hydraulics and manage water levels between head regulators. They contribute to unreliability in the system. In addition to this most head regulators in Sindh (as elsewhere in large canal systems in South Asia) are not calibrated nor is it part of the routine to do so. The implication of this (and the fact that official design discharges have not been adjusted) is that the introduction of volumetric pricing as a measure for demand management is very practically impossible and in fact misses the point, as it assumes a degree of discipline that is missing in canal management at present.

Table 2: Canal commands in Sindh

Barrage	Canal	No. Of Distributaries	Cultivable command area (ha)
Sukkur	Dadu	120	226120
	Rice	90	210097
	NW	127	432183
	Khaipur Feeder East	55	152711
	Rohri	283	960275
	Nara	163	894840
	Khaipur Feeder West	68	161343
		906	3037569
Kotri	Akram Wah	49	227323
	Fulleli	74	402957
	Kalri Baghar Feeder	110	294074
	Piyari Feeder	113	340828
		346	1265182
Guddu	Begari Sindh Feeder	85	232059
	Desert Pat Feeder	45	174809
	Ghotki Feeder	64	303332
		194	710200
Total Sindh		1.446	5012948

There are a number of other distinct features of the canal system in Sindh:

- Most of the canal area in Sindh is underlain by saline groundwater. As a result conjunctive use of groundwater and surface water has not taken off – as it for instance has in the upstream Punjab Province (where groundwater supplies are estimated to take care of more than 40% of on farm supplies). According to official statistics there are only 16,000 tubewells in the Province (against 550,000 in Punjab). Conjunctive use is also less popular because water supplies per area are relatively high in several canal commands in Sindh, making additional groundwater supplies unnecessary.
- Drainage problems are wide-spread in Sindh. They are typically attributed to overirrigation. Yet turning natural depressions into irrigation commands and distorting natural drainage paths by constructing roads and canals have also played their role. The major investments in drainage concern surface drains and vertical drainage well fields (so called SCARPs) and in particular the Left Bank Outfall Drain. This Left Bank Outfall Drain at a cost of nearly US \$ 1 Billion undoubtedly is the most important, single project in Sindh of the recent years. It provides surface and subsurface drainage to an area of 550,000 ha in the Districts of Nawabshah, Sanghar and Mirpurkhas on the Left Bank of the Indus. Under the project a ‘spinal’ surface drain was constructed, connected to the Arabian Sea. The spinal drain is supplied by a network of tributary surface drains as well as 1600 deep tubewells and scavenger wells.

- Because of the salinity of groundwater surface irrigation supplies are also very important in providing domestic water sources. The irrigation canals serve as source for most municipal systems in Sindh. In addition in many rural areas hand tubewells supplied by the fresh seepage water along canals are an important source of domestic water supply. Official statistics put the number of persons using surface supplies at 26% for the entire Province, but if one adds the seepage-supplied tubewell the proportion of population that depends on canal supplies for rural Sindh becomes far higher.
- The topography is extremely flat in Sindh. A major consequence of the low slope is that water courses constantly change location – disconnect from one distributary or minor and reconnect to another one. The reason for such a shift is often the siltation of a distributary (which is then usually accelerated after a number of water courses change).
- Sindh is the tail-end province in the Indus irrigation system. As a result there is a constant fear that the Province does not get its due share. The choice with the water available is to distribute it to the canals or to leave a base flow in the Indus Delta – it is difficult to get accurate data on the actual intakes into the canals

3. Institutions

The management of the irrigation system in Sindh is currently in transition. Since it was developed from the late nineteenth century onwards the canal system in Sindh was in the hands of the Irrigation and Power Department (IPD), part of the Government of Sindh. The IPD operated the main barrages, canals, drains in the Province, initiated relatively smaller construction work, undertook emergency management and routine repairs. It took care of water distribution to the distributaries and checked the outlets to the water courses. It also administered the entire system and was responsible for sanctioning changes to the water courses (size of outlets, locations, use of pumpsets), though increasingly in the last twenty years the latter rather sensitive function moved upward in the administration. At one stage it even lied with the Minister of Irrigation and Power.

In essence the function of the IPD has been mainly self-steering and functional – the operation and maintenance of the canal and drainage system. It had no distinctive role in water resource management in the Province (nor had anyone else), its performance was not supervised. It also did not have to generate its own revenue or collect water charges apart from double checking assessment records (see next section).

One distinct feature of the irrigation administration in Sindh was the limited number of professional staff – particular given the enormous size of the area served, with one senior executive engineers assisted with two or three assistant engineers typically in charge of an areas as large as 2-300,000 hectares. This enormous lack of capacity also goes a long way to explain why so little water management has taken place in the system. In spite of the obvious issues (waterlogging, multifunctionality of the irrigation and drainage system) there is no coordination between irrigation, drainage, storm water removal and groundwater management – let alone a link between irrigation system management and water supply and sanitation. In contrast the small and overstretched professional civil engineering cadre, the IPD is has a large field-based staff. The main group consisted of linesmen (darogha's) and maintenance workers (beldar). The total staff strength is 33,000. A comparison with official staffing norms suggest that total staff strength exceeds requirements with a factor 2.

Since 1997 the irrigation and drainage is in transition. Reforms were initiated, bit only took shape from 1999/2000 onwards. The reforms have their background in problems encountered in large irrigation systems elsewhere in the region – though probably in an amplified form in Sindh: the inability to subsidize irrigation and drainage operations with public resources, the difficulty to maintain

performance standards and the increased unwillingness of water users to contribute in cash or in kind. Some features:

- Income from water-related tax (abiana) in the Province in 2002 was equal to 20% of the actual establishment and operation and maintenance expenditures
- Within these expenditures there were substantial spendings on overheads (57%) and on items such as non-monitored electricity supplies to public irrigation pumps and drainage systems; whereas actual annual O&M expenditure is less than 50% of the norms and no provisions are made for capital replacement
- Neither have mechanisms been put in place to fund capital costs apart from the traditional public funding or international loans; loans are in fact used to pay for part of the maintenance costs;
- Water charges in Sindh are among the lowest (see section 4) in the world (all included) – US \$ 3-6/ha. In spite of the low rates, there is considerable opposition to significant raises in water charges.

The reform process in Sindh was defined in the SIDA Act that was passed in 1997. It has two faces, First is the transition of the Irrigation and Power Department into a financially autonomous Sindh Irrigation and Drainage Authority (SIDA) and the formation of ultimately self-financing Area Water Boards (AWB) on the canal commands. To reach this stage of self-financing a period of ten years was earmarked for the new institutions. The second part is the transfer of responsibilities at distributary and minor level to Farmer Organisations (FO's). These Farmer Organisations are supposed to typically serve areas of 3,000 hectares. This makes them stand out from the watercourse-based Water Users Associations that were formed earlier under the On Farm Water Management Program. These earlier Water Users Association played a short-lived role in the lining of water courses, but disappeared into informal arrangements or nothingness soon after.

The SIDA was established in 1998 and the first AWB in 1999. Subsequently four more Area Water Boards have been announced and two more are on the anvil. This would extend the reach of the new institutional arrangement to half of all canal commands. At present the jurisdiction of SIDA is de facto defined by the canal commands handed over to Area Water Boards, whereas its role in managing the barrages is on the agenda. Of the Area Water Boards the first one – the Nara AWB – is on steam. Of particular interest for this study is that since 2001 it has started to set up its own revenue system. An independent stakeholders board rather than a distant government secretariat moreover oversees the work of the Nara AWB. In addition some 70 FO's are in place – and approximately half of those have signed a transfer agreement. This transfer agreement puts the FO's in charge for the maintenance and management of the distributary or minor, allows them to collect their own source of income and suspend supplies to non-paying customers. The agreement also commits the FO to pay the AWB for their services.

The IPD continues to exist side by side and is officially still in charge of all non-AWB areas, whereas several of the newly announced AWBs still follow IPD procedures. Moreover as almost all personnel to the new organizations formally is on loan to the new AWBs there is a intermingling of old and new.

4. Pricing

Though there are a number of changes in the new AWBs – discussed in section 6 -, the water pricing strategy in Sindh by and large still follows the pattern set in the first half of the 20th century. The price is determined politically by the Provincial Government. It is not determined by the IPD as the service providing agency, but considered for all practical purposes as a provincial tax. A main difference with the past, however, is that until the 1960's income from water taxes exceeded expenditures on the irrigation system. The irrigation sector de facto cross-subsidized other activities. Roles then reversed,

however, because water rates were not adjusted. Collection moreover became inefficient. As a result irrigation and drainage services at present are a drain to the Provincial Budget.

Farmers pay the water tax (abiana), in addition to other taxes (land revenue, local funds and ushr) – lumped together in one bill. Abiana is paid on the basis of the area under cultivation with different rates applying for different crops. The prices range between US \$2-8/ha, which makes them low even in comparison with other large scale systems in South Asia. Different rates apply for gravity systems and lift channels, the latter subject to double rates. The relative prices of the different crops bear a relation - although not completely straightforward - to a notional water consumption of the concerned crop. In areas, where drainage systems are in place, the irrigation price is surcharged. This so-called drainage cess varies but may be up to the equivalent of the water charges (abiana). Yet with the prevailing low rates the difference between operation cost and water charges in areas served by drainage infrastructure is even larger.

Table 3: Water rates in Sindh 2002

Perennial crops	Current (2002) in PAR/acre	Current (2002) in US \$/ha
Garden, banana, vegetable	142.14	6.12
Sugarcane	181.87	8.07
Kharif crops		
Rice	88.78	3.83
Cotton	93.09	4.02
Fodder, maize, jowar, pulses	39.85	1.72
Other Kharif Crops	75.33	3.25
Rabi crops		
Wheat and other Rabi Crops	53.30	2.30

Ability and willingness to pay

The current water prices also have little to do with the value of water or the farmers ability to pay. There is amazingly little information on farm incomes in Sindh. The scattered material available however suggest a large difference between farm incomes and the level of water charges, making water in spite of its vital role a minor component of total farm costs.

One indication of farm incomes comes from work by IIMI in 1997/8 on three distributaries in the Nara Canal Command. The figures – based on farmers recall – were calculated on the basis of land cultivated, including land destroyed prior to the harvest. They give a weighted average of kharif and rabi crops. They vary between US \$ 145/hectare for Heran Distributary to US \$ 328/hectare for Bareji Distributary.

In 1995 the Sindh Development Studies Centre (SDSC) similarly made an assessment of farmers ability to pay for the operation and maintenance of irrigation and drainage facilities. Towards this end fieldwork was done on Amergi Branch Canal (in Nawabshah). Net incomes as they appear from this study are low. This is explained by the rather unusual inclusion of an opportunity cost for land of US \$40/ha per year and the expenditure side as well as a charge for a farm manager plus the rather low cotton prices in that year. Even then the SDSC study concludes that farmers are able to pay for the irrigation services. It appears however that the main bottleneck in payment is not ability to pay but willingness to do so. This in turn is related to the confidence of water users in the quality of services and the integrity of the revenue collection system. On both scores confidence is low. As the chairman

of the Sindh Abadgar Board explained in an interview – “farmers are willing to pay for services but not for someone else’s wife jewellery’.

and that abiana levels can be easily increased. Yet farmers may not be able to pay for all drainage services.

Table 5: Crop wise returns (pre-tax) for land owners on Amerji Branch, Sindh

Crop	Per hectare returns	Crop	Per hectare returns
Wheat	US \$ 69	Sugarcane	US \$ 183
Cotton	US \$ 61	Oil seeds	US \$ 40
Rice	US \$ 52	Fodder	US \$ 175

Source: SDSC (1995)

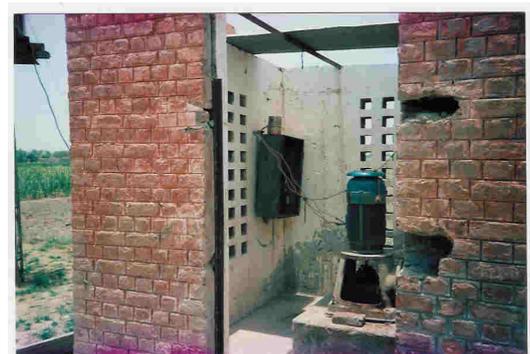
More anecdotal but nevertheless significant is a comparison between land lease prices and water charges. Land leases prices obviously vary from one place to another but they are in a range of US \$ 50/ hectare per year. A major factor in their price is the location of the plot along a distributary or minor. Land that is located in the upstream section of a minor will collect a lease price that is more than double that of a similar plot in a downstream area. The reason is that through a variety of informal devices (widening outlets, using pumps or siphons) upstream farmers are better-placed to direct additional water to their land. The cost of this and the bribes paid in the process are modest. Estimates differ from US \$ 6-15. Though by their nature they cannot be precise they indicate an order of magnitude. What seems to happen is that it is fairly straightforward and inexpensive to make use of the upstream location of land to assure better water prices. This order of magnitude appears to be far less than the value of additional water supplies as such. This benefit and the value of water that is expressed in it is not reflected in water pricing, but in other markets – in this case the land market.

Relation between prices and costs

The water rates at present also bear no relation to costs of operation and maintenance of the system or the capital expenditures. Table 4 gives an overview of the cost involved in operating one of the largest canals in the Province, the Nara Canal – as was well as a forward projection in balancing expenditures and revenue. At present total expenditures are PAR 550 M or US \$ 9.5 M, whereas revenue from abiana is PAR 115 M or US \$ 2 M. Revenue from non-abiana sources (municipal water charges, fishery rights) is negligible.

The main cost items are salaries, but also maybe unexpectedly energy costs. These energy costs come on account of the pump stations operated in the upper reach of the canal system and on account of the drainage tubewells and scavenger wells. Energy costs have always been problematic, because either no meters are provided on the pump stations or meter-reading is problematic. Electricity theft from the public facilities moreover is widespread. For a long time this expenditure item was invisible as the federal energy company was allowed to deduct its charges at source from the provincial financial allocation. This also gave rise to inflated billing.

Energy costs for drainage tubewells – a major cost item



Another important cost item in the accounts of the Nara Area Water Board are the performance contracts on LBOD. When LBOD was completed maintenance was sublet to contractors – as an alternative to the built-up of a large in-house facility. Of all items on the list maintenance of the canal system is a relatively modest item – also because this component is systematically underfunded.

Table 4: **Financial projections Nara AWB**

Expenditures	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7
Salaries and wages	165	163	120	76	72	66
Establishment costs and general overheads		23	25	28	31	34
Retrenchment costs		46	46	46	46	46
Service charges to SIDA		1	1	13	15	21
Maintenance costs surface irrigation systems	73	81	89	97	107	118
Electricity costs irrigation pumping systems	30	33	36	40	44	48
LBOD performance contracts (Sanghar and Mirpurkhas Units)	65	67	74	74	75	86
Electricity costs LBOD pumps	60	66	70	76	81	86
Costs for revenue collection (5% in 2002)	6	7	7	8	9	10
Provision for bad debts/ non recovery (percentage non recovery)	75 65	40 25	37 20	35 15	40 15	48 15
Depreciation of assets	11	12	13	15	16	18
Total expenditures	550	563	539	523	551	595
Income	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7
Abiana (current rates plus 10% inflation a year)	115	127	139	153	168	185
Drainage cess		32	45	82	99	135
Abiana increase			44	88	132	176
Non abiana income	5	11	12	12	13	13
Government contribution to drainage (as % of costs)	125 100	120 90	115 80	105 70	94 60	86 50
Government balance subsidy of which contribution of NDP loan	305 65	274 67	183 74	83	45	0

From the overview a possible financing plan for the future can be read as well. To make the AWB self-financing over a period of six years a multi-pronged strategy should be followed. On the expenditure side it should consist of reducing salary costs, following the transfer of responsibilities to FO's, controlling energy costs and modestly increasing the budget for main canal maintenance (whereas the burden for the maintenance of distributaries and minors is assumed by FO's). On the revenue side the non-recovery (mainly resulting from underassessment see next section) of water charges should be brought back, drainage cess should be introduced and abiana increased. Moreover, there is scope to increase the income from other sources besides abiana – see box. Such a multi-pronged strategy make it possible than in the long run government subsidy to the irrigation system would be brought down

to a subsidy for part of the drainage services, which are partly of public goods nature. In short, to restore financial parity the answer is to use a large number of options simultaneously, not just water pricing or more effective water charging systems.

Box 1

Possible sources of revenue to an AWB apart from irrigation charges (abiana)

- Water charges to municipal and industrial users
- Fishery rights on canals and drains
- Toll on using canal roads
- Concession on planting trees along canal banks
- Converting irrigation guesthouses in hotels/ wedding halls
- Developing tourist accommodation on waterfronts
- High value residential accommodation on waterfronts

5. Water charging

With the exception of the command area of the Nara Area Water Board, water charges in Sindh are collected by the Revenue Department. The Revenue Department resorts under the Deputy Commissioner, the administrative head of the Districts and its highest authority. In each subdistrict there is a patwari, who supervises the tapedars and muktiadars, that do the assessment and collect the abiana. Abiana is collected with a number of other Provincial taxes, in particular the land revenue, local funds and ushr.

Assessment

In Sindh revenue not only collection but assessment as well is traditionally done by the Revenue Department. Official irrigation water charging is based on the area cultivated and the crops grown. A laborious procedure is required to collect information on these two parameters for an area, as large as Sindh.

The basic unit for the assessment is the revenue village (deh). Revenue assessment is carried out after each major cropping season by tapedars or muktiadars in each deh, supposedly on the basis of walkthrough or field inspection of each farmland. Based on the (often outdated) area map they identify each farmland and the owner for assessment purposes. Each farmland is then divided into cropped acreage plots and the assessment of each plot is carried out by applying the rate of abiana for that crop. Under this methodology, the revenue official his skill and experience and sometimes arbitrary judgement to determine whether an acre of plot has produced a full yield of crop or some other percentage and then applies that percentage to calculate the abiana charges. The whole method however is open to manipulation and leads to under-assessment of abiana. Further, there are nine main rates of abiana including for kharif and rabi crops. In addition, rates for government and private lift schemes are double and half the gravity rates respectively. This increases the opportunities for misreporting.

For several years the assessment by the Revenue Department was double-checked by “abdars” of the Irrigation Department. The two assessments, that usually differed then would have to be reconciled. The assessments by the abdars were generally higher (50%) than those of the Revenue Department.

Among farmers there is considerable ill-feeling with respect to the abiana assessment by the Revenue staff, translating in very low willingness to pay. The main complaint concerns the arbitrary assessment of the area under cultivation. A common grudge is that, as they are forced to be lenient on big landlords, revenue staff try to achieve revenue targets by overcharging smaller landlords.

Overall there is considerable underassessment as a result. A second leak in the charging system are the dispensations due to crop failure. Whereas in 1992-3 and in 1994-5 kharif the entire abiana was waived, because of the floods and adverse weather, in other years several areas are singled out as they suffered from some adverse effects. These dispensations are wide open to abuse. Officially the abiana is remitted to the concerned landowner. In reality many provisions are booked under this heading, but not returned to the concerned farmer at all.

The total loss because of underassessment – especially underreporting and misassessment - are huge. One source that looked at fairly accurate crop coverage data and compared them with abiana assessments, estimates that as much as 60% of revenue disappears this way. This figure is substantially higher than the losses due to non-payment.

Billing and payment

In the traditional system billing is done twice a year by the revenue staff and payment is made to them in cash. At present customers are expected to pay in January and July at a time when they are relatively short of cash. It has been proposed to shift the billing dates to March, resp. September to make the payment more convenient and avoid repeated reminders.

A larger resentment among land owners than the timing of payment is that often no receipts are given after payment. This makes it questionable how the money is booked. It also increases opportunities of not accounting for special dispensations (see above).

Enforcement

Non-payment of abiana ranges from 5-10%. This is not high – but this is because the assessment is the main arena for negotiation for those not willing to pay. Under the traditional system the sanctions for defaulters are financial penalties and next the threat of imprisonment.

Closing supplies is not part of the traditional repertoire of sanctions. The difficulty lies in the problem of singling out a single defaulter, if a watercourse supplies several farmers. In the past however it was not uncommon for IPD staff to use the pretext of maintenance to close water to an area with a notorious payment record. The reforms of 1998 for the first time introduced the possibility of this penalty.

6. Changes under the reforms

The 2001/2002 was the first season that one AWB (the Nara AWB) and 24 FO's collected their own abiana. Given that this was a 'first' undertaken under difficult circumstances, the results were not disappointing.

The Nara AWB engaged its existing cadre of abdars to undertake the labor-intensive assessment. The Nara AWB currently employs 136 abdars of which 122 are working in the field. In the past the Revenue Department – which simultaneously collected three other local taxes had four times this number. On that pattern the NAWB would have required a total of 492 abdars. Currently, the average salary of an abdar is Rs 3,570 per month (Rs 42,840 per abdar, per annum). With 136 abdars the total

salary per annum amounts to Rs 5.83 million. With a total cadre of 492 abgars the cost of salary would however amount to Rs 21.08 million. This would be equivalent to 18.7% of the total revenue collection of Rs 115 million for 2000/2001. Clearly this is not feasible and the AWB had to make do with the limited means.

Neither was the supervision of the assessment exercise optimal. Although in theory there is a system of supervision involving the canal assistants, the assistant executive engineers and the executive engineers, in reality it was not realistic to expect the senior engineering staff to manage the revenue collection process, as they have other operational duties too. In spite of these constraints. The assessment done by the AWB abgars was of the same order of magnitude as the previous assessment done by the Revenue Department¹. Crops were assessed on 607,000 acres, which is low given a command area of 2,100,000 acre. In kharif 1995/6 for instance assessment was done on an area of 790,000 acres. It could then be that there has been an underassessment of probably close to 25% - similar to the assessments of the Revenue Department, though the special drought conditions may have played a role as well.

There were no changes in the abiana rates. The introduction of drainage cess has been proposed, but has not taken effect yet. After the bills were sent, payment of water charges started slow, giving rise to considerably worry. In the end however collection rates touched 82%, which for a first year with an unprepared organization is impressive. What made all the difference was the engagement of darogha's in the collection process. Since darogha's are in charge for local level water distribution, the link between payment and water supplies was easily made. The same happened at FO level. Several Fos were late in collecting their money and the delay was transferred to the AWB. The board of the AWB came together and decided to use the sanction of suspending supplies. This apparently had a remarkable effect and FO payment accelerated and exceed individual payment. FO payment was 88%. Some FO's however had difficulty in coming to effective collection and landed up with a few members taking care to resolve the entire dues of the organization.

7. Conclusions

- Farmers in fact pay a substantial price for water - but not in the official and non-official transaction to the Revenue Department and Irrigation Department, but in the land transactions. As irrigation and drainage prices are effectively non-priced and are a minute part of the farm budget, good land becomes expensive.
- In restoring the finances of the irrigation service provider a multi-pronged approach is preferable – looking at control costs, making water charge collection more efficient, tariff increases and exploiting other non-water charge related sources of income.
- In payment effective sanctions, in particular the threat of suspending supplies is effective. Next – transparency and stakeholder control are important in restoring the confidence in the integrity of the system.

¹ Problems of under collection existed in the past. The Nara Canal Study had estimated the potential abiana revenue of Rs 105 million for 1995/96, using the actual assessed cropped areas and the abiana rates of 1995/96, against the assessed revenue of Rs 76.1 million by the Revenue Department. On the basis of this comparison, the assessment of the Revenue Department was lower by 27.5% of the potential revenue¹. Such estimated under-assessment is still prevalent in the assessment exercise carried out by the NAWB and the FOs.