Spate water rights

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Spate irrigation

Spate irrigation provides a livelihood for a large number of economically marginal people in areas as varied as South Asia, the Middle East, West Africa, North Africa, the Horn of Africa, Central Asia and Latin America. Estimates for the area under flood irrigation are not easy to make, as the area under spate irrigation changes from year to year and as spate irrigation has never had the amount of attention from development agencies or tax authorities, that perennial irrigation has had. Spate irrigation is typically found in arid and semi-arid regins, where highlands border plains. It uses seasonal floods for irrigation – but as the floods differ from year to year the area served by it fluctuates widely.

Managing unpredictability

Unpredictability is inherent to spate irrigation, yet water distribution rules regulate the distribution of the unpredictable water supplies. They impose a pattern and reduce uncertainty and potential conflict by regulating the relations between the landowners that have access to flood water. Particularly where flood water users depend on one another in maintaining flood channels and reconstructing diversion structures, agreement on how water is distributed is a precondition for cooperation between different parties in this respect.

In the medium and long term unpredictability also characterizes spate irrigation systems. Changes due to the increase in land levels and changes in river courses and flood channels are almost inevitable. This makes spate irrigation system far more dynamic than perennial irrigation systems (Hadera 2001). The way rights are defined in spate systems is also different. Water rights in spate systems are essentially reactive – dealing with accepted claims and distribution rules in a changing environment rather than measurable rights to a natural resource, as in perennial systems (van Steenbergen 1997b).

The chapter describes the different types of water distribution rules (6.2) and how they are enforced (6.3). The final section (6.4) describes how changes in the water distribution rules take place, as a result of external interventions.

Water distribution rules

There are several types of rules in spate irrigation and it is usual to find that two or three are applied simultaneously in any system. The repertoire of water distribution rules is:

- the demarcation of land that is entitled to irrigation;
- rules on breaking of diversion bunds:
- proportion of the flow going to different flood channels and fields;
- the sequence in which the different fields along a flood channel are watered;
- the depth of irrigation that each field is to receive;
- the practice regarding second water turns.

Rules on land demarcation

Demarcation rules define the boundary of the area entitled to irrigation. As such, it precedes all other water distribution rules.

Instead of merely regulating seasonal water supplies, the demarcation of the land entitled to irrigation also predicts what will happen when changes in the entire system occur. In dynamic spate systems such changes are frequent, as rivers change their course and flood channels breach, scour out or silt up. Demarcation rules are conservative, because, in the wake of these changes they try to re-establish the prior situation. They in fact often protect the prior rights of downstream landowners, because they prohibit new land development upstream, which could in the end result in the diversion of flood water to new territories and a redefinition of the group of shareholders. The demarcation of the outer boundaries also ensures that overspill from breaches in flood channels does not develop into an established practice (van Steenbergen 1997). In the spate systems of the Suleiman range in Pakistan very explicit agreements existed, obliging landowners to plug gullies that developed after severe floods. This would prevent a new drainage patterns to develop in these alluvial plains. Such rules are not in force everywhere though.

What happens at times is that overspill areas – though they do not have a recognized entitlement to the spate flows - get a secondary right to the flood water, de jure or de facto. They are only irrigated during high floods, when the flow in the flood channels is so high that it is allowed to escape at certain pre-arranged points to avoid damage to the channel network downstream.

Like most distribution rules demarcation rules are in place when water is scarce. They are more common in long-established lowlands systems, where floods are more of a given quantity than in new systems or highland systems. Ahmad et al (1998) for instance document the ongoing land formation in four small upland systems in Balochistan (Pakistan). Using the silt deposited by the spate water in the fields as well as from borrow pits in the flood channels, command areas increased as population pressure did in the lat 50 years. The area under spate irrigation increased from 148 ha to 205 ha. The increase in population and tractors enabled a better control of the water. In highland systems where the flood water when it comes is usually abundant rules on land demarcation are unusual.

Demarcation rules in the long run have to be applied with flexibility. Particular in lowland systems with small slopes scouring of rivers and sedimentation of canals and command area make changes over a longer period inevitable.

Rules on breaking of bunds

A category of rules closely related to the rules on the boundary of the spate area concerns the breaking of diversion structures. These rules are usually in place in areas where the entire riverbed is blocked by earthen bunds. In some spate river the construction of earthen bunds is not allowed under customary rule (Kohler 2000), but in larger river beds with flat slopes they are common.

Where earthen bunds are used, they are generally made in such a way that they break in case of high floods. This works as a safety valve (see also section 3). It avoids substantial damage to the channel network, as very large floods are passed down the river rather than playing havoc with the flood channels.

In several systems there are also rules on purposely breaking bunds – once the designated area served by an upstream bund is irrigated (see above) or once a certain part of the flood season has lapsed. An example is the rules on breaking of the gandas (earthen bunds) in the Nari River in Kacchi, Pakistan – formalized in 1917. The rules

are still observed, although there is considerable tension on the actual breaking of the bunds.

A fairly typical example of such a dispute is the Chacar Bund on the Chakar River in Balochistan. In the past this earthen bund – spanning a width of some 50 meter - used to be constructed with the help of bullocks and tractors. It collapsed every year, as the water seeping through its base undermined the structure. However, in 1990 the land owners of Chacar were given a generous allocation of bulldozer time by the government. They utilized this by making a very strong bund. The bund did not fail that year. It irrigated all demarcated land of Chacar and then the Chacar land owners allowed the water to escape through a breach in their flood channel to an area that was not entitled to flood water. The same pattern repeated itself in the subsequent year. The Chacar land owners were not keen on breaking their bund, as they wanted to spare themselves the effort of rebuilding it. This led to fierce protest from downstream land owners, who moved the head of the district administration. They argued that he should break the hated Chacar bund. His verdict was however only a very partly success for the complainants. He reasoned he could not break the bund since there was no earlier agreement on the breaking of the bunds in the Chakar River. He maintained the demarcation rules on the other hand. He order the Chakar farmers to repair the breach in the flood channel and avoid that water went to unauthorized

Rules on Nari System, prepared in 1917 on revision of the old rules

From 10 May to 15 August the land owners of the upper Nari are allowed to make gandas (earthen bunds) in the Nari River. After 15 August they are not allowed.

When the land served by one ganda in Upper Nari is fully irrigated, the landowners in that ganda would allow land owners of the next ganda to break it

After 15 August the land owners of lower Nari are allowed to make gandas in the Nari River. Land owners in upper Nari are not allowed to irrigate their land in this period or let the water to go waste.

Water is not allowed to go waste to the low lying areas east and west of the Nari River. Guide bunds will prevent water flowing to these areas – all landowners will contribute towards these bunds with farmer in lower Nari paying twice the amount per hectare in case bunds on the upper Nari were broken

If any dispute arises judges appointed by Kalat State would inspect the area and would be authorized to decide and allow a downstream party to break the ganda at a proper time or instruct repair to a guide bund to take effect within 5-10 days. In case repairs to guide bunds are not made the main bund of the area concerned may be broken.

In case a landowner refuses to contribute gham (the contribution for maintenance) his land may be confiscated

Rules on flow division

This third category of rules arranges the distribution of water between the different flood channels. Where an area is served by several flood channels, there may be an agreement on the proportion of flood water going into the different channels. In practice, this is usually done by rather crude devices, by having the head sections of flood channels at different width and by placing obstructions in front of some of the channels. Flow division may also be practised along a flood channel with the width of the field intakes determining the proportion of flow that each field receives.

Ethiopia – typical flow division between two tertiary channels

Whereas the flow divisions are usually fixed, the traditional main division in Wadi Labah in Eritrea is an example of a flow division structure that is adjusted by moving brushwood around. During the spate the water masters of the main five flood channels stand on top of the structure and adjust it to ensure that the flows to each area are fair. (Heile, pers. comm.)

Main flood distribution. Eritrea

Rules on sequence

A fourth category of rules - which again may or may not be in force - is the pre-arranged sequence in which fields are irrigated. Where it applies, the route that water follows within the area entitled to

irrigation is described in detail: which branch channel will receive water first and the priorities of the different fields within the branch channels, with irrigation generally moving down from head to tail of the channel (Serjeant 1964, Maktari 1971). Sequence rules are called 'numberwar' or 'saroba paina' (Pakistan) or 'rada'ah' (Yemen). The sequence usually adjusts to the level of the floods. If the flood is low, the water will only flow in one or two of the priority branch channels and the numberwar will apply to those channels only. But, if the flood brings large quantities of water, it will find its way through a large number of channels simultaneously. Moreover, during high floods the force of water is larger and instead of being obstructed and regulated, it will flow in a large number of fields at the same time.

Rules on depth of irrigation

All the four rule impose a certain predictability and equity. The definition of the command areas, rules on breaking diversion bunds and the limitations on the width of field intakes prevent the water from being monopolized in the head reaches of the flood irrigation system. The numberwar identifies priority areas. Equity issues are also outspoken in the fifth type of water distribution rule, which concerns the depth of irrigation, expressed in agreements on the height of the field bunds. These field bunds are usually made from the sediment deposited within the flood fields and help maintaining the fields at reasonable level. The height of the bunds determines the amount of flood water that can be stored in the fields. Rules on the height of the bund and hence irrigation depth are not common in spate areas in Pakistan. Instead they seem to be standard practices in Yemen. The prevalence of irrigation depth rules in Yemen is probably related to the practice of field to field irrigation. In this practice one farmer takes his turn, as soon as his neighbour completes the inundation of his land. He does so by cutting the bund surrounding the field of the upstream land owner. In this system competition between neighbours can be fierce and to mitigate this, rules on water depth may have evolved. In contrast, when each field is fed by its own separate intake, as is usual in the spate irrigation systems in other areas, such conflicts are rare and rules on the depth of inundation are unusual. The amount of water applied depends on the height of the field bund, but in most systems there is no limitation in this respect. Field bunds are seen as a way of disposing of the excess silt that accumulates with the flood water and can reach any height.

In general it appears that the smaller a single field the lower the field bund. In this respect there is a large variation between spate systems with regard to the sizes of fields. On the one hand there are small parcelled fields in spate systems such as Yandafero in Konso, Ethiopia. On the other hand there are fields of 1-2 ha in size with field bunds reaching more than a meter, as in Yemen. A main factor explaining this variation is the frequency and size of the floods, as well as the slope of the command area. The Yandefero system is marked by a large number of mild floods, allowing a distribution of water not very different from a perennial system. In other systems instead floods can be high and episodical. To control such quantities of water requires large fields and high bunds.

Ethiopia – unusually low field bunds related to large number of mild floodings

Rules on second turns

A final category of rules is the right to a second water turn. Several crops, though they may survive on one water application, give significantly higher returns when they are irrigated more than once. Sorghum, wheat and cotton are examples. Sorghum in fact is often grown as a ratoon crop to catch an off-season flood. For other crops, like pulses, one watering is sufficient.

In many systems, floods come and go and a season may bring a series of spates. This poses a dilemma: is the water that comes with a second flood to be applied on the land that is already under cultivation? Or is priority given to those cultivators whose lands are still dry? Both variations exist, either the option of upstream land owners to take a second turn, or the obligation to restart irrigation from the place where it stopped the previous time, and irrigate all downstream land before upstream owners can use the water again. Where restrictions are imposed on upstream owners, they usually apply in the planting season. There are exceptional cases though such as the Jama Bund in Kharan, Balochistan (BMIADP 1994) or Wadi Labah in Eritrea (Heile, pers. comm.), where irrigation in the next season starts where it stopped the previous season.

Water distribution rules and maintenance

There is a very strong link between the rules on distributing spate water and the organization of maintenance. In many systems the right to irrigation by spate flows is tantamount to one's contribution to repairs to the headworks or flood channels. If one abstains from public duty one is simply not allowed to open one's the intake to one's field. (Particularly if the network of fields is supplied by individual intakes). This link between water distribution rules and maintenance has two more implications.

First, as mentioned in the introduction to this chapter water distribution rules will often serve to reduce uncertainty and thus avoid conflict and create a more or less coherent group of land owners, dependent on the spate system. In particular, the demarcation of the irrigated perimeter is important as this defines who has an entitlement to the flood water. Without it, it is difficult to form a group of partners, making the organization of the recurrent repair work problematic, not to mention the formulation of rules on cost sharing and water distribution.

Second, apart from coherence critical mass is important in undertaking repairs. The more so when repair is dependent on labour from human beings and draught animals (as in most systems in the past), a large force is required to rebuild structures and make repairs. Excluding fellow land users can jeopardize the sustainability of the system.

The different water distribution rules can then be interpreted as having an effect on the organization for maintenance: some rules will help create a strong core group that will take the lead, whereas other rules will expand the number of land users that will share in the water and shoulder the burden of the maintenance. Examples of rules that create a privileged core group are the numberwar rule and the convention whereby upstream farmers can avail of a second water turn, before all downstream land is served. Mitigating rules, working towards homogeneity in interests among a large number of land users, are the demarcation of command area and restrictions on depth of irrigation and second water turns[1]. The scale of the flood irrigation system is an important factor in imposing mitigating or exacerbating rules. Mitigating rules, that work to increase homogeneity between upstream and downstream users, appear more feasible in small systems than in large systems. However, as a system becomes larger and more complex, it is increasingly impractical to enforce restrictions on upstream land owners, because the cost of policing such agreement goes up and the natural solidarity of the small group is lost. As a result, mitigating rules are less common in large flood irrigation systems. Instead in for instance the larger spate systems of the Kacchi Plains of Balochistan or the now disused spate systems in Saudi Arabia (Wildenhahn 1985) different villages have a different maintenance levies – with areas in less privileged places contributing proportionally less to the collective effort.

[1] Another mitigating practice - though not a water distribution rule - is the fragmentation of landholdings. Land owning families may own a mix of plots with a high and a low probability of being irrigated. The setback of a disappointing year is distributed equally and interests are spread homogeneously.

Enforcement and codification

"*This system is at the momebt being governed by the 'Kulyat and Riwajat Abpash' meticously worked out by the British more than a century back. This document has been and still is the Holy Book of spate irrigation. And like true believers, we are treating it, in word and spirit like the Holy Book. We consider it Divine, we consider it Sacred, but we do not believe in it and we do not follow it..*"

(Major Aminullah Khan Gandapur, farmer, 1990, pg 122)

The extent to which spate irrigation rights are codified varies. The most elaborate codification concerns spate systems in Yemen. In several system rules on the distribution of water and the maintenance of the works date back 600 years. Enforcement of these rules for a long time used to be the responsibility of local sheikhs. With the investment in Yemen and the collectivisation of agriculture in Aden government employees and staff of agricultural cooperatives took over. When their role declined, they left a worrying vacuum (Al-Eryani and Haddas 1998).

Similarly rules on spate rights in the larger systems in the Suleiman range in Pakistan (D.I. Khan and D.G. Khan) have been

documented in a register, formulated during the British period, the Kulyat Rodwar or Kulyat and Riwayat Abpashi'. The register contains a list of all villages responsible for the labour on each bund. A special Collector was in charge to organize these activities. This special functionary was responsible for the enforcement of these rules, exhorting farmers to plug gullies and encouraging them to rebuild their bunds. In the other main spate irrigated area of Balochistan, the long and extensive Nari system in the Kacchi Plains detailed rules have been written down concerning the breaking of the different bunds in the spate river (see box). These rules were enforced by the 'teshildar ghandahat', an official put in place by the then ruler of the area, the Khan of Kalat, whose land was located at the tail end of the system. After Kalat State joined Pakistan in 1948 this functionary become an employee of the new government. Similarly the water rights on the Porali River, like the Nari an almost semi-perennial river were defined.

What is striking that in all these examples the authority with which the rules are enforced has declined. Striking – as one could also expect the opposite, as water becomes more scarce. There are a variety of reasons:

- decline of both traditional and modern government as rule enforcing mechanism
- decline in spate systems, with increased use of ground water in the spate command areas
- confusion of responsibilities on management after public investment in the system
- change of opportunities with the introduction of mechanized power.

It is however more common for water distribution rules not to be formally registered, even in relatively large systems. In some systems this is because there is little competition for the floods as the distance between the mountain where the spate flows arise to the sea or the main river, where they discharge is short.

Even when there are no formal rules local district officials are often the requested to intervene in conflicts in spate systems – particularly where it concerns water rights between different areas.

In smaller systems and within tertiary units enforcement is by local arrangement. Many systems have water masters, usually supervising water distribution and organizing maintenance.

Changing water distribution rules

In the past development decades several countries have undertaken programs in support of spate irrigation (see chapter 1). In Yemen, Pakistan Tunisia and recently in Eritrea investments are made in civil works, replacing traditional structures. In Pakistan moreover provincial government have supported spate irrigation systems by making bulldozers available at below market rates. It has often been these external interventions – by government or well-resourced non government organizations – that have altered a fragile equation that existed under customary rules.

In improving spate irrigation systems – whether with engineering works or through the use of mechanized traction – water distribution rules change. The most common changes are:

- better upstream control
- integration of previous independent systems .

- change from free flow to controlled flow

Almost by definition external improvements to spate irrigation systems result in better upstream control – that is provided they work (chapter 3). Often this has disturbed delicate balances that existed between upstream and downstream diversions. It is not uncommon to see that the new structures create a new water management situation – which over time changes the de facto water distribution rules, in spite of agreements that existed earlier and in spite of rules agreed at the time of construction of the new structures. The change in water distribution in Wadi Rima in Yemen after the construction of the head works illustrates this. The common headworks allowed better upstream control of the spate flows – over time reducing the volumes of water passed on to the tail area. The tail area that in the past was served by an independent intake (Al-Eryani and Al-Amrani 1998).

Another example is the Rehanzai Bund (box). The Rehanzai Bund also shows that it is hard to make enforceable agreements in the absence of a pervasive authority and in a situation with considerable differences in power. Added to this is another impact of replacing temporary headworks with engineered permanent ones. Permanent structures change the relations between upstream and downstream farmers, because upstream land owners become less dependent on the contribution of tail end land owners. This may make them less amenable to concessions in the distribution of flood water.

The Rehanzai Bund

The massive earthen Rehanzai Bund was constructed at the confluence of the Bolan Rover and an off-shoot of the Nari River on the Kacchi Plains of Balochistan. The construction of the bund allowed the control of spate flows in the Bagh area, where previously the spate water had flown too fast to capture. After the Rehanzai Bund was completed a number of well-placed landlords constructed a series of permanent diversion bunds, immediately downstream of the new bund. This obstructed the water rights of the tail-end Choor-Nasirabad area. The district administration supported the case of the down stream farmers and instructed them to break the bund after their area had been served. The landlords with considerable clout refused to do so. As time passed more and more people had to leave the Choor Nasirabad area for lack of farm income. The remaining group was too weak to push its case and the upstream land lords won the day.

Kohler (2000) describes that the changes in spate diversion, following the construction of civil works, may even go further. Two permanent spate diversion dams were built in south Yemen in the seventies on the at that time transboundary Wadi Harib. As a reuslt the tail end farmers did no longer receive any flood flows with the excpetion of years with unusually large floods. They turned to groundwater development. Yet as the recharge of groundwater was also cut off in this area, water tables fell dramatically.

Another change sometimes brought about by engineering interventions is the integration of previously independent systems. A variation of this is when a system with a free intake is replaced with a common controlled diversion. Such changes bring persons and even entire communities together in one system, that in past may have had little affinity with one another. Sometimes the reason to integrate different systems is to obtain the economies of scale that

justifies the investment in controlling the spate flow in a river at one point with a relatively huge investment in civil works. There is a world in reverse here, as the down side of 'the economies of scale' is that it forces groups of people that had little interaction earlier to work together and distribute scarce water. In some cases this has led to intractable social problems. In other cases it has prevented integrated systems even from coming about.