Irrigation Watercourse, "Area One", Pakistan

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1 Static Analysis - Collective action

1.1 The Commons Dilemma

The potential appropriation problem / poor coordination of appropriation of resources: The potential appropriation problem (in this case, poor coordination of appropriation) has largely been overcome, but not entirely. The Area One project was designed with the objective of preventing famine over a large area by the means of an effective water delivery system which could be operated at a low cost. However, failure in quality of planning, design, construction and management of the tubewells provide limited scope for achieving this objective. While clear procedures have been established for the rotation of water by the appropriators, there are major irregularities in supply and operation of tube wells. This disproportionately benefits large farmers and tube well operators.

The potential under provision of public infrastructure: The potential under provision of public infrastructure was not successfully overcome in Area One. Major tubewells, which is shared infrastructure, were maintained to a great extent, but a few minor canals and distributaries were in major disrepair. Informal arrangements exist for mobilising farmers to carry out maintenance on a communal basis, however, this was found to greatly depend on the extent of social cohesion within the farming communities. Conditions for group action were not found to be ideal in Area One. Farmers have no incentive to pay water charges, since the proceeds go to general revenue and not toward re-investment in maintenance of the tubewells.

1.2 Biophysical Context (IAD)

1.2.1 Natural Infrastructure

The Area One watercourse is situated in Pakistan. More generally, it is located in South Asia. The watercourse is characterised by a very large command area, low rainfall, a gentle gradient and good soils. Due to the rainfall conditions, the cropping patterns usually allow for cultivation of irrigated dry crops. The overall benefit from tube well water on crop intensity was found to be low even when movement to more water-intensive crops (sugarcane, rice and citrus) was considered. The water-table levels have reduced, but substantial proportions of waterlogged and saline area have been reported reclaimed.

1.2.2 Hard human-made infrastructure

Long established, networks of canals and tubewells across the water course were built in the 1960s to aid in distribution in water for irrigation. This watercourse has a very large

command area and a simple and inflexible canal design with few control structures. The canals and tubewells are planned for low cropping intensities. Responsibilities for canals, tubewells, drainage and agricultural extension is divided between a few agencies: irrigation administration (by small number of trained civil engineers), staff of skilled and unskilled labourers (for maintenance), field assistants, and farmers within the watercourse command (operation and maintenance below the watercourse outlet). However, planning deficiencies in the area led to large scale water losses, environmental damage, and the need for rehabilitation. Remedial action began in 1974 to make the watercourse manageable. For the monitoring of the operation of the tubewell, a highly centralised hierarchical administrative body consisting of non-appropriators such as tubewell operators and Ministry officials (Irrigation and Agriculture) was established.

1.3 Attributes of the Community (IAD)

1.3.1 Social Infrastructure

Resources Users- There seem to be about 5000 appropriators in Area One (inferred). This group is fairly homogenous, apart from differences in location from the tube wells and farm size. There are farmers at the head and the tail of the watercourse, and some farmers have larger farms than others. The operation and maintenance below the watercourse outlet is the collective responsibility of the farmers within that watercourse. Beyond this informal soft infrastructure (the expectation of collective responsibility), no other forms of formal guidelines for collective action ensure the equitable provision and distribution of the resource.

Public Infrastructure Providers - The Irrigation Department and the Agriculture ministries, under the unified Area Development Authorities, have been set up to ensure coordination of activities relating to this watercourse. Area One is managed by government bureaucracy and decision making was found to be highly centralised. Tubewell officials are in charge of overseeing water distribution (usually civil engineers, not officials that are agriculture-oriented) and agricultural extension service officials are established with the purpose of horizontal coordination of authority. Vertically, there is a division of responsibility between the appropriators (farmers) and the non-appropriators (Area One project organisation), and between the non-appropriators (between different categories of staff within the project organisation). There is no mention of the imposition of a sanction in case of the violation of the rules-in-use. While there is knowledge within the community of the appropriation process, there is evidence of inequitable water distribution practices that favour larger farmers and tubewell operators. It can be inferred that it is likely that large farmers attempt to bribe operators and officials in cases of violation.

1.4 Human Infrastructure

It was observed that before the introduction of the tubewells, the farmers in Area One made rational use of scarce water, to the best if their ability, that they received by under-irrigating. After the tubewell network was developed, resulting in slighter higher agricultural yields but revealed that the farmers knowledge of crop water requirements was very poor. This led to serious water loss, since the land was not properly levelled. Lack of support from public infrastructure providers about knowledge of water and farm management as well as weaknesses in water distribution at the main system level have served to impede capacities of appropriators.

1.5 Rules in Use (IAD)

- **Position Rules:** Officials, tubewell operators and agricultural extension services as appointed under ministries of the government assume supervisory positions, but do not possess any legal jurisdiction with respect to the violation of rules.
- **Boundary Rules:** The tubewells are generally open access but is only restricted to farmers who have agricultural lands within the watercourse.
- **Choice Rules:** There are rules requiring withdrawal of water at a certain time slot on the basis of the amount and location of land held by the appropriator. The ownership of the land within the watercourse lends rights of water withdrawal. Leasing, renting, selling, transferring land within the watercourse is permitted and the boundary rules transfer to anyone deemed by the original owner of said land. Additionally, the relationship between the farmers and the officials and the tube well operators (administrators and technocrats).
- **Aggregation Rules:** Aspects of social structure and extent of social cohesion within the farming community in Area One to ascertain operation and maintenance of the resource. There is no evidence in the text of how individual decisions are aggregated.
- **Scope Rules:** Formal organisations appointed under the government have no sanctioning power in terms of fines imposed. Hence there is no legal measurable aspect that impedes the choice rules. Informally, there are rules of collective action requiring labour for maintenance and repair of, however, no explicit mention has been made in the source document of how such a rule is imposed.

- **Information Rules**: Land ownership, capacity in decision making, information recording the maintenance and performance of the system, extent of withdrawal or extraction permissible per farmer.
- **Payoff Rules:**
  - Water charge rates and recovery levels are low ($5/ha for canal water$;10/ha for canal and tubewell water; 60-70
  - There are no formal sanctioning tools such as fines or taxes that are imposed for mis- or over-appropriation. By default, there is no evidence of incarceration or penalty of any kind for violating the rules-in-use. However, they are not permitted to obtain external aid (but can obtain aid form regional agencies) to develop other forms of extraction/ withdrawal technologies. Developing contracts or purchase agreements for selling of resource units is not permitted.

1.6 Summary

Management of an irrigation project for a large and complex system such as Area One proves to be a cumbersome task. The performance of the project has been found to be unsatisfactory on counts of productivity, equity, environmental stability, cost, and cost recovery of the overall irrigation system. These major deficiencies in performance of water distribution was attributed to design or technical factors (planners gave little thought to designing appropriate operating procedures, farmers were given little information about expected supplies for

maintenance and less than optimal staffing levels), as well as socio-political factors (larger farmers and tubewell operators benefiting more than smaller farmers). Increased capacity of appropriators (farmers) in decision-making, efforts towards a more decentralized organizational structure, greater social cohesion, channel-based irrigation management as opposed to one that is village-based, and closer coordination between the two government ministries involved were listed as solutions for effective functioning and management.

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