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From Sharing the Burden of Scarcity to Markets: Ill-Fitting Water Property Rights and the Pressure of Economic Transition in South Asia

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Received: 21 May 2019; Accepted: 12 June 2019; Published: 20 June 2019

Abstract: In this paper, we consider the process of transition from an equitable distribution of water to support semi-subsistence outcomes to market-oriented agriculture. We examine the stresses placed on water institutions as farmers adjust production to become more market-oriented and consider the relationship between farmers and irrigation officials under different scenarios. The paper is used to highlight some of the challenges pertaining to property rights but also considers the dangers of simply transposing solutions from full-market agriculture in developed economies to developing nations and countries in transition. In this context the role of Participatory Irrigation Management is scrutinized. We argue that this approach can potentially accommodate greater flexibility and market orientation in agriculture but ultimately the beneficiary-benefactor relationship between irrigation officials and farmers in parts of South Asia needs to be seriously challenged.

Keywords: property rights; participatory irrigation management; South Asia

1. Introduction

Water remains a contentious and emotional topic, especially when it comes to the rules that govern use and sharing (e.g., [1]). In addition, water is one of the more misunderstood resources and numerous misperceptions abound.

For instance, on the one hand, water is notionally considered renewable which often underpins calls for it to be freely available to all—it falls from the sky so why should farmers or others pay for its use? (see, for example, [2]). Of course, such arguments overlook the capital and other resources that are required to harvest, store and deliver the resource and the temporal and spatial opportunity costs of consumption are overlooked if the water is free. Ignoring such costs will inevitably sponsor inefficient consumption without recourse to the overall benefits of use [3].

On the other hand, water is seen as fugitive so 'saving' water by preventing it leaking into the landscape, is perceived as virtuous, even if those leaks underpin other valuable uses and users (see, [4]). Yet as noted, others would argue that water should be free—so what is the logic of saving something which has no value, since it is to be freely available to all?

The real point is that water cannot be saved, and it clearly does have value as expressed through the sixth Sustainable Development Goal. However, achieving that goal is no simple task (see, for example, [5]) and water can only be physically transferred in time and space and this ultimately provides value for some users potentially at the expense of others [6].

Most of the misperceptions about water would not be especially problematic were the resource plentiful in all locations and at all times, but fallacies become important when genuine scarcity arises.

The notion of water scarcity in the economic sense implies that resource availability falls short of the various demands such that water use comes at an opportunity cost—some other use is foregone.

Throughout the world, dealing with excess water demand has often been too hard for many policy makers, such that they have opted to take actions to increase supply (see, for example, [7]). Unfortunately, many of those actions are illusory in the longer term and given the global predictions of water scarcity and the added challenges associated with increasing climatic variability (see, for instance, [8] greater effort aimed at dispelling these myths is urgently required. This is arguably no more important than in the developing world and in places like India and Pakistan where water scarcity can be severe and climate impacts combined with population pressures are projected to be profound [9].

The reality that water cannot easily be saved and that its use in one place comes at a cost to others has not escaped the attention of farmers who are located at the tail end of surface water irrigation networks in places like India and Pakistan. When water is accessed and used, it is usually downstream interests that are most obviously impacted. Thus, satisfying downstream water users' demands has become a default measure of how well an irrigation network is functioning in many parts of the world (see, for example, [10]).

More specifically, the capacity to meet tail-end interests has frequently been used as a metric of successful irrigation management (e.g., [11]). If we were to ask an irrigation engineer in Pakistan or India 'what was one of the main objectives in managing the irrigation system', they would likely respond that managing to ensure that tail-enders receive some water is a high priority.

That type of response is arguably appropriate in the context of ensuring resource access to shore up smallholder semi-subsistence agriculture. However, what is not clear, is how such rules and approaches might need to adjust as economies develop and farmers are encouraged to become more market-oriented. Moreover, can adjusting such rules help promote market orientation of agriculture in its own right?

In this paper, we consider the process of transition from an equitable distribution of water to support semi-subsistence outcomes to market-oriented agriculture. We do so by contrasting the property right arrangements for water in India and Pakistan with those in Australia. In the case of India and Pakistan we argue that there is mounting pressure to have farmers become more market oriented so the contrast with Australia, where almost all agricultural production has a market orientation, is apt. The paper adds to the development literature whilst also contributing to the water management literature by highlighting some of the challenges pertaining to property rights. We also use the paper to consider the dangers of simply transposing solutions from full-market agriculture in developed economies to developing nations and countries in transition.

The paper itself is divided into four additional parts. In Section 2 we focus on the underpinnings of an equitable sharing approach to water resources in surface water irrigation and the modifications to farmer and government behaviour that have been occurring at the margins within this framework. Section 3 considers the 'Rolls Royce' of water marketing by highlighting the features of water distribution in Australia's irrigated agriculture in the Murray-Darling Basin. The challenges of transition in India and Pakistan are contemplated in Section 4, paying particular attention to institutional nuances. The final section comprises brief concluding remarks.

2. The Underpinnings of Scarcity and Equitable Water Distribution as a Proxy for Efficient Irrigation Management

We have noted that in an economic sense scarcity implies that total demand outstrips the available supply such that some form of rationing must occur, but scarcity can be defined in different ways. For example, [12] distinguish a fourfold typology of water scarcity with two components driven by natural phenomena and another two accounted for by human actions. In the same contribution they proffer the widely-cited Falkenmark index where scarcity is expressed as a relationship between renewable fresh water and population.

Here, 1700 cubic metres of water per capita per year is set as the benchmark with countries/regions falling below this threshold defined as water stressed. An index of 1000 cubic metres corresponds with water scarcity and 500 cubic metres equates to absolute scarcity.

Whilst straight-forward and useful in some contexts this approach has limits. First, scarcity of water is itself a social construct and the enumeration provided by the Falkenmark index might be overshadowed by other discourses. For instance, [13] shows that in some parts of India the perceptions of deepening drought do not align well with the actual data, but the narrative persists and is used to rationalize the construction of dams in some cases. Similarly, [14] argues that discourses can be developed by government to satisfy political ends, which goes beyond the metrics of the Falkenmark index. Second, the index has a proclivity to disguise localized problems associated with water access at specific points in time. For instance, in terms of agricultural water use, failure to access water at times of crops stress is a key consideration. Thus, whilst a nation or region might enjoy relative water abundance on an annual basis, a particular farmer or group of farmers can be seriously disadvantaged if water is not on hand at critical points in the production cycle. In the absence of water access, crop failure can ensue and even usher in periods of absolute poverty and chronic hunger ([15]).

Against that background it is important to appreciate the link between scarcity and equity especially through a water sharing lens. The idea of equitable water sharing has been explored extensively in the context of apportioning waters between nation states (e.g., [16,17]) but in the case of localised agricultural water management the issue hinges on production returns and risks. Moreover, in countries unable to provide baseline income support outside of any reliance on agriculture, sharing water becomes the purported means by which some segments of the population are shielded from unreasonable poverty and/or being exposed to extraordinary risks. Accordingly, the allocation and distribution of water to allow sufficient access to maintain at least some level of production across all producers has important political economy dimensions in these cases.

Equity in irrigation distribution in parts of South Asia has become so enshrined as an objective that it has a unique empirical meaning. For example, [18] p. 162) note that "equity in irrigation water distribution—the operating objective of all canals in Pakistan's Punjab—is deemed to have been achieved when the amount of water distributed to every outlet along a distributary is in a proportion to its design discharge that is approximately equal to the proportion of water delivered at the distributary head to its design discharge."

This approach stands at odds with the view espoused by most western-trained economists who view the issue of resource allocation under scarcity from a market perspective. The logic of market allocation is compelling on efficiency grounds. Resources are bid, through the interaction of supply and demand, to the highest use values, thereby generating the greatest possible surplus for the community at large. However, there is a need to go beyond these rudiments and give attention to property rights, because without property rights the market cannot function efficiently, if at all [19]

The notion of property rights in economics differs from the conventional use of the term, where this is presumed to relate solely to the ownership of something. A property right in economics relates to the power of an individual or group to control a resource. More specifically, property rights describe the relationship between the benefits that come from a resource and how they are appropriated [20] pp. 202–203). Since property rights describe the benefits that accrue to specific individuals or groups, reciprocity requires that such rights simultaneously proscribe which individuals or groups are excluded from accessing those same benefits; in that sense property rights are arguably more about the relationships between different people than between people and things, like land and water [21], (p. 453).

Property rights can be considered along multiple dimensions including exclusivity; access; use; transferability; divisibility and flexibility (e.g., [22,23]). Some property rights also have clearer specifications than others; that is the quality of property rights is not always the same. This is not the same as unfettered individual rights—it is about the clarity with which any attenuation of rights is described and applied.

Virtually all rights are attenuated to some extent by a superordinate body, but the benefit of having clearly specified property rights is that it helps individuals interact more efficiently and seek out cooperative solutions to conflicts over resource allocation [23].

Take the case where a tail-end irrigation farmer has a clearly defined and enforceable right to access a specific volume of water from an irrigation channel at a particular time and on a specific day. Upstream farmers, aware of these downstream rights, are obliged to let the water pass to the downstream user, else face sanctions that potentially exceed the benefits from accessing that water out-of-turn. In this example, a superordinate body (the irrigation entity—e.g., state government officials) effectively attenuate the rights of the upstream farmer, else the rights of the downstream users will be ignored. Conflicts are alleviated, at least to the extent that any overall shortage is shared equally across all users and the upstream farmers are willing to comply.

If the irrigated landscape is broadly homogenous, with similar soil types and similar crops and cropping practices etc., then the efficiency impacts of equitable water sharing of this form are likely to be minor, in the aggregate sense. For example, if all farmers are growing rice under identical conditions and water availability is halved, then the fall in aggregate rice production would be no different if all farmers grew half as much rice or if half the farmers grew none at all while the other half maintained full production. Of course, one important caveat applies that relates to the flow of water through the irrigation system as it moves from head to tail and the evaporation and seepage that occurs in irrigation channels. If this is material and if the seepage, in particular, is not captured by others, then disproportionately reducing production at the tail end of the system will have less overall impact on production than if the shortage is shared proportionately between head and tail.

Setting aside the issue of seepage and evaporation in channels for now, it is important to note that the distinction between a technically efficient production outcome (i.e., maximum agricultural output given the resources) and an equitable water shortage borne equally across all users is relatively minor when farmers are homogenous and operating under similar conditions (of course this only refers to aggregate production and makes no comment on distribution). Where farms and farmers do not exhibit these features the gap between technically efficient production and an equitable water sharing arrangement can be expected to widen, a point taken up later.

In this scenario to date the state plays two critical but related roles. First, the superordinate entity (state) manages the irrigation network to ensure that water is available within the system as a whole and second it enforces the rights of downstream farmers by attenuating the take by upstream users. Successful irrigation management is then presumed to manifest in water reaching tail-end irrigators but this only results from (a) capable physical management of the water and related infrastructure and (b) adequate administration of a property rights regime. These dual roles place the state in a powerful position such that water users might best be described as 'beneficiaries' rather than right holders. Perhaps not surprisingly, irrigation departments throughout South Asia almost universally refer to irrigation farmers as beneficiaries rather the customers, clients or water users and this has material property right implications.

The use of the term beneficiary also implies that there is a benefactor who, if conditions suit, might opt to manage the network differently or reassign rights without compensation. Here the quality of rights really matters, even if they are considered beneficiary rights. Weakly defined rights potentially allow state irrigation officials to assign water from some farmers to others with little regard to the initially implied rights that attend managing for equalising scarcity. In that context, clearly defining rights and ensuring the quality of title is clear and enforceable is an imperative, regardless of whether a market is in play.

The scenario described to date has been premised on only limited heterogeneity in production and/or the capacity of farmers. In practice this is increasingly not the case and there are wide variations witnessed between the outputs and profitability of farms and farmers in South Asia (see, for instance [24]). Some of these arise from variations in biophysical characteristics (e.g., soil

types), human capacities (e.g., skills in production and marketing) and other socio-economic factors (e.g., access to credit, and capacity to carry risk).

We have also focussed on technical efficiency and said nothing of the variations in price of different outputs. Such changes, and the varying abilities of farmers to respond will also drive differences in profitability.

Given these variations, it might not be that surprising that endeavouring to equalise water shortage across all agriculturalists will necessarily be less efficient than a scenario where only the least productive farms curtail production in the face of shortage, freeing up water for the more productive uses and users.

However, for such an arrangement to occur, farmers who set aside their current legitimate call on water must be compensated for the diminution in rights, or the validity of all rights then comes into question. Of course, this is what occurs when some farmers, with greater political influence than others, usurp the notion of equal distribution of scarcity. In South Asia this often comes in the form of larger farmers depriving smaller farmers of their water take, such that the equity consequences can be quite severe (see, [25]).

As it stands, irrigated agriculture in India and Pakistan is at an awkward cross-road, especially in regions which have struggled to develop. On the one hand, farmers—large and small—are increasingly encouraged to adopt market-oriented outputs and to go beyond producing standard staples like rice, wheat and maize. This trend has been evident for some time (see, [26]) and national governments and funding agencies continue to emphasise agricultural diversification as a route to enhanced livelihoods, especially for poorer states and provinces (e.g., [27]). In addition to the perceived benefits of this approach as a means of alleviating poverty, this approach is also spurred by concerns about nutrition. More specifically, the expansion of carbohydrate production may have alleviated immediate hunger, but the nutrition of the population is still found wanting due to the absence of sufficient diversity in diets. Greater diversity in production is a seen as one panacea (e.g., [28]).

Nonetheless, farmers are constrained from pursuing market-oriented crops when input distribution cannot easily match the expansion of the variety of cash-producing outputs. First, capital is often not easily accessible, especially for smallholder farms, making the shift to the new technologies required for cash cropping problematic. Second, labour is increasingly in scarce supply in rural areas as market forces draw larger numbers of unskilled and semi-skilled workers into cities. Third, the cultural and political prestige of land means that land itself cannot be easily moved into the hands of those seeking to expand cash cropping. Fourthly, water property rights, especially surface water, are crafted around equal sharing of shortage, such that even the least productive users are constrained from legitimately transferring their access to others, should that be economically feasible (see [29]).

Given the tensions that attend these arrangements, a number of short-term scenarios have emerged. Here we focus exclusively on those relating to water. First, the inability of the current property right regime for surface water to meet the demands of users has given rise to a rapid expansion in groundwater extraction ([30] pp. 292–293). This has been aided by expansion of the electricity grid, developments in pumping technologies making pumps cheaper to purchase and operate, and the fact that throughout South Asia groundwater rights have been vested in the owner of the overlying land with virtually no effective attenuation by the state. Evidence has emerged that these arrangements entrench familiar inequalities, with larger farmers more disposed to accessing greater volumes often at the expense of others ([30] p. 303). There is widespread consensus that this is unsustainable, but the political will for serious intervention remains remote (see, for instance, [31]).

Second, governments aware of the weaknesses of surface water management, have sought to shift responsibility to others. This has manifested in Participatory Irrigation Management (PIM) and in some cases Irrigation Management Transfer (IMT). It is important to note that there are wide variations in PIM and IMT across the region but in most jurisdictions the shift in authority to farmers has been partial, at best (see, [32,33]). In addition, little attention has been given to the real challenge of property rights prior to endeavours to have farmers purportedly take control.

This has meant that in some cases PIM has simply been used to disguise the transfer of water to more influential users, without recompense to those deprived. Compliance with water take rules designed to equalise scarcity is still weak under many PIM schemes.

This is not to argue for the initial distribution, where scarcity is equally borne by all: rather, it points to the need for clearer property rights that allow those displaced of access, through the emergence of market-oriented agriculture, some compensation for their loss.

3. The End Game for Market-Orientated Agriculture

Australian water property rights regimes have been frequently heralded as a means of dealing with scarcity and change [34]. Whilst the structure of contemporary arrangements is usually the focus, what is often overlooked is that relatively rigid state-imposed shares of irrigation water and land persisted in communal irrigation schemes until the early and mid-1980s. In the largest irrigation area in the Murray-Darling Basin, the region now known as Murray Irrigation, landholders were restricted to owning a limited number of so-called 'home maintenance areas' and the water that attended those areas was fixed. Moreover, women were restricted from owning land in their own right, if they were partnered to another farmer in the region [35].

As market-orientation became an even greater imperative during the micro-economic reform era of the 1980s and 1990s, farmers had little option other than to purchase the maximum land possible under the home maintenance provisions and then seek work-arounds with neighbours for redistributing water. Given the expansion and development of major agricultural industries like cotton, rice and wine grapes and the decline of others like citrus, these arrangements came under intense pressure. Perhaps not surprisingly there was some resistance from large state-based irrigation departments which had a benefactor approach to some irrigation communities when asked about modifying water rights.

As is well-documented [34], water was ultimately separated from land in the early series of reforms and greater unbundling has occurred subsequently under the National Water Initiative, such that entitlement and allocation markets are now a vibrant feature of the irrigated agriculture landscape. Limits on extractions were put in place to shore up rights but this did not happen without errors, some of which are yet to be rectified (e.g., [36]).

First, the failure to distinguish between water rights that were active from those that were inactive, meant that in the initial separation and marketing phase actually increased extractions, thereby undermining the purpose of capping consumptive use [37]. Second, as surface water rights became more valuable and difficult to access because of the cap on overall extractions, farmers began to turn to groundwater extraction that was less rigidly controlled. Even though Australian jurisdictions benefit from having all water (surface and groundwater) vested in the Crown, famers were quick to note that limits had not yet been rigorously established on many groundwater supplies and opted to activate licences and use more. Rigorous measurement and monitoring of groundwater extractions remains a work in progress [38].

Third, most Australian jurisdictions and particularly those in the Murray-Darling Basin, opted to socialise the majority of return flows from different water uses. This means that water entitlements are mostly described in terms of volumes that are extracted for use and little attention is given to what happens to the water once extracted. The failure to account for return flows gives rise to a perverse outcome from the introduction of technologies that seek to generate more technical efficiency by users. More specifically, such technologies can undermine water returning to the system, thereby diminishing the rights of downstream users dependent on the hydrologic return flow. This has proven particularly problematic as government environmental agencies have sought to ensure water passes through the entire basin to reach downstream ecological sites. The most politically appealing way of achieving those environmental flows was to subsidise water-efficient technologies in preference to purchasing rights from irrigation farmers. The upshot is that much less water is reaching downstream than predicted [36].

Finally, even though the water market has been ultimately well-accepted by most farmers, attempts to rent seek continue. A recent drying in the Eastern states has given rise to calls from some irrigation interests to return environmental water purchased by government and/or to have it accessible for free [39].

Whilst not that surprising on some fronts, these types of actions, if pursued stand to significantly undermine the functioning of the market, insomuch as water should be allocated to the highest value rather than that which is most easily satisfied by political intervention. These arrangements would ostensibly weaken the rights of other users who do not enjoy political influence, a complaint levelled at the current arrangements in some South Asian contexts.

Nonetheless, overall the approach to water property rights in Australia has delivered significant gains and with additional effort to deal with the extant weaknesses they will likely deliver even greater success. However, to seek to transpose these successes to South Asia by simply mirroring property rights arrangements would ignore critical components required for an adjustable water allocation system.

4. Challenge of Transition

As part of the earlier description of South Asian irrigation we noted that the commitment by irrigation managers to evenly distribute shortages across all users acted against the forces promoting a market-orientation in agricultural production. In turn, this conflict was described as manifesting in a range of undesirable outcomes, including the weakening of rights of downstream users through political intervention and pressures for noncompliance. Similar adverse consequences were noted for groundwater users, with excessive extractions by those who can afford deeper pumps weakening the rights of those less able to afford such technologies.

In contrast, the water property right reforms in Australia were characterised as strengthening the rights of all users, inasmuch as even downstream users are able to sell their allocations or entitlements and all market participants have an interest in preventing unilateral weakening of rights by superordinate bodies. Similarly, extant right holders benefit from the capping of extractions since additional demand must be met through the purchase of rights for existing users, thereby strengthening the hand of current right holders. However, the transition to market flexibility in Australia was not without its challenges and was supported by several broader preconditions that are either absent in many parts of South Asia or under development.

First, Australian agriculturalists can expect limited direct assistance from government for meeting the cost of inputs. Some support exists in the form of favourable taxation arrangements on profits, but by and large, agricultural enterprises are treated similarly to other profit-seeking endeavours and expected to bid resources away from other users, should they wish to employ them. Failure to secure a profit from agriculture can result in exit from the industry and this is assisted through a focus on income support rather than input support (see, [40]). A relatively robust national transfer system is in place to ensure that excess poverty does not occur, at least in the absolute sense. In addition, there are a range of public programs to assist individuals to transition from one form of employment to another, through re-skilling and when large-scale adjustment occurs additional income support is often on hand (see, [41]). The upshot is that farmers who fail to make an adequate return do not need to stay in production to receive support. These arrangements encourage those opting to exit agriculture to maximise the value of assets as they leave, including water, and unbundling water from land and creating a market for water helps achieve that end.

Clearly, the same cannot be said for South Asian farmers. Input subsidies for agriculturalists are common throughout the sub-continent ranging from energy, to seed, fertiliser and machinery [42]. This weakens the incentive to accept more flexible water property rights insomuch as retention of the status quo continues the flow of input support. If water is moved away to other more valuable uses, the farmer would likely reduce production and this, in turn, would lessen their access to support. The point is that a stable transfer system focussed on income support enables individuals to consider

the value of using inputs solely on the basis of economic merit. Actions by governments that seek to modify the way inputs (like water) are managed are less threatening in that environment.

Second, Australian farmers are heavily focussed on international prices for their outputs and receive few non-market signals to raise (or lower) production. Most price support schemes have long been abolished for Australian farmers, strengthening the requirement to have greater flexibility in production to meet changing international demands. Similarly, most farmers enjoy access to well-developed marketing chains such that the demands of end users are quickly translated to producers, often requiring them to adjust their input mix [43]. A capacity to reallocate water between uses and users is thus consistent with this ethos and, once the reallocation mechanisms are functioning, generally supported by farmers.

In contrast, output prices are heavily influenced by government intervention in the sub-continent. This includes price support schemes that simultaneously encourage overproduction of some commodities and under-pricing of others [42]. These conditions are not conducive to greater flexibility in water allocation—those receiving output support are encouraged to hold onto the existing rights structure (albeit of poor quality) and those being under-cut by government actions can ill-afford to trust the state to reform rights in an efficacious way. These arrangements weaken any support from farmers for more flexible water rights.

Given that input and output subsidies by governments in South Asia are likely to persist in the near term, a question thus arises about what is feasible to make water allocation mechanisms more amenable to market-oriented agriculture.

We noted earlier that PIM has emerged in South Asia and in some cases is showing signs of success. One reason that the successes are not more widespread is that PIM has been used, in some instances, to simply patch over existing failings with the property right regimes. There are also numerous differences in the way jurisdictions have deployed PIM and the sincerity with which irrigation departments have embraced devolution and flexibility varies. Where PIM has been successful, a level of authority has been vested in farmers that (a) is consistent with their technical and management capabilities (b) resonates with the social and cultural ethos of the farming community and (c) reflects the share of financing that attend water distribution and management. Whilst (a,b) will take some time to change, action on (c) in the short term is possible.

In a recent review of PIM in east India and Pakistan, it was noted that there is a wide range of approaches to charging within PIM and the sharing arrangements for any revenue accruing to irrigation payments (see, Burton, Crase and Cooper, this volume). For instance, in Assam in east India all revenues collected from farmers by water users are transferred to the state irrigation department, while in neighbouring Bihar 70% of collections are retained locally. In the adjoining states of Punjab and Sindh in Pakistan, farmers retain 50% and 40% of collections, respectively. There is some alignment with responsibilities and revenue retention insomuch as water user groups in Bihar are expected to apply local sanctions for non-compliance whereas sanctions for non-compliance are enforced jointly by the state and local groups in Assam. Similarly, the greater retention of funds at a local level in Punjab loosely aligns with an expectation that more maintenance will be funded at the local level, through both cash and labour, relative to Sindh. However, what is not clear is the extent to which any of these combinations leads to more flexibility in the deployment of water, a necessary condition to support market-oriented agriculture.

Within each of the above four jurisdictions there are marked differences in the functioning of water user groups and one of the key performance measures used, as noted earlier, is the extent to which tail-end farmers have their existing rights fulfilled. Perhaps an adjustment to these metrics is overdue given the increasing focus on market-orientation and water user groups might be given licence to develop means of satisfying all users within their membership within some bounds. This is not to suggest that the notion of meeting tail-ender rights should be abandoned—rather local water groups may be better placed to establish their own means of satisfying right holders beyond the delivery of water. In some progressive areas in South Asia this is already occurring (e.g., Gujarat—see, [44]) and

encouragement by the state to foster water right experimentation within water user groups might be preferable to the rigid and failing effort to cling to the status quo.

States might signal this intent by excising the nomenclature of 'beneficiary' from their dealing with irrigation farmers. Whilst seemingly trivial, this could encourage a broader mind-shift amongst both the bureaucracy and farmers and yield greater innovation within local water management.

Greater authority on the part of local water users to vary the structure of irrigation payments and the mechanisms for collection may also be warranted. As with the sharing of revenues, there are already significant variations across the region in the way irrigation services are charged and the collection processes, but these are driven at state/provincial level. In some jurisdictions, monies are collected by local farmers, as is the case in Bihar in east India. In others, collections rests with the state (e.g., Assam in India) and in other instances joint collection is the norm (e.g., Punjab and Sindh in Pakistan). In some jurisdictions account is made of the area of land irrigated but the assessment of that area can rest with locals (e.g., Bihar in India and Punjab in Pakistan), or both involve government officials (e.g., Sindh in Pakistan and Assam in India). The charging regime can also be adjusted to account for the water use of different crops (e.g., Sindh in Pakistan), but this is not universal. Metering by volume is not the norm and unlikely to be so, given the sheer numbers involved in smallholder agriculture. In the absence of metering, there is still scope for local experimentation that aligns with any adjustment to rights agreed at a local level; but again, authority needs to be assigned for this to occur. As a minimum, state and provincial bodies might consult with irrigation farmers about their preferences for tariff design, reinforcing the shift away from the treatment of water users as beneficiary.

5. Concluding Remarks

The contribution of agriculture and agricultural development in South Asia has been significant and its prominence is not about to change overnight. Attempts to encourage greater market orientation within agriculture are motivated by ambitions to reduce rural poverty and also offer a partial solution to the emerging challenges around nutritional deficits. It is also the case that market-orientation by farmers does not always require the stimulus of the state—even smallholder farmers readily adapt to signals related to profitability, provided they are unequivocal.

Unfortunately, the historic property right regimes around the allocation of surface irrigation water act as a break on the move toward market signals. Water resources cannot be easily deployed within a regime that emphasises equal sharing of the hardship associated with shortage. Moreover, the tension created by these inconsistencies can often result in the least-well-off having their existing rights usurped.

In the developed world, separate and tradeable water entitlements have been shown to offer solutions to these tensions. However, they are not easily created and nor are they automatically translatable to a developing world context.

As a minimum, there is room for giving farmers genuine authority for resolving some of these conflicts locally within constraints devised by the state. Clearly, the state has to be willing to cede some control and go beyond the rhetoric of devolving choices to farmers. Serious analysis of the way water tariffs are structured and attention to the preferences of farmers would be a useful starting point. In addition, consideration might be given to the overall welfare of farmers as a metric of the success of irrigation, rather than delivery of a minimum of water to every farmer.

Overall, a change in mindset that results in farmers not being treated as mere beneficiaries of state indulgence would be a helpful adjustment.

Author Contributions: L.C.—drafting initial manuscript and developing conceptual foundation; B.C. and M.B.—refining conceptual foundation and redrafting iterations of the manuscript.

Funding: This research was funded by the Australian Centre for International Agricultural Research (ACIAR) project ADP2014/045.

Conflicts of Interest: The authors declare no conflict of interest.

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