

Landlordism, Tenants and the Groundwater Sector: Lessons from Tarai-Madhesh, Nepal

Fraser Sugden



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Landlordism, Tenants and the Groundwater Sector: Lessons from Tarai-Madhesh, Nepal

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Front cover photograph shows a shallow tube well and diesel pump in the wheat fields of Bhaudaha, Morang District, Nepal (*photo:* Fraser Sugden).

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Summary

Over recent decades, there has been a shift in the focus of government irrigation schemes towards groundwater development throughout the Gangetic Plains, especially in the Nepal Tarai-Madhes. Unlike many other forms of irrigation, in groundwater irrigation, a person's capacity to irrigate is intricately connected to their ability to invest in pumping equipment and the boring of wells. This is particularly significant given the deeply entrenched inequalities in landownership in the region. A significant gap in the literature is the role of landlord-tenant relations in shaping groundwater use. A significant portion of the rural population in the Nepal Tarai farm as tenants for both absentee and local landlords, a legacy of the centralized feudalism of the nineteenth and early twentieth centuries. This report explores the impact of landlord-tenant relations on access to groundwater irrigation through both direct investment and the groundwater market. It is shown that tenant farmers have a reduced incentive to invest in tube wells due to insecure tenure and high rent payments, while landlords themselves have been shown to offer little support. One option is to rent tube wells or pumps.

However, the costs and incentives to rent wells or equipment are high due to monopolistic markets and high diesel prices. While the contribution from landlords could increase incentives for investment, this is rarely the case, particularly if landlords are absentee. Furthermore, water is not always available when required. The collective ownership of wells offers a new set of options for tenant farmers, but it presents its own set of challenges. These include the continued barriers to renting pumping equipment, the need for landownership or tenancy papers to be part of a user committee, and capture of land by elite and wealthy farmers.

In sum, it is crucial that policymakers are aware of the challenges posed by landlordism today in the Tarai and elsewhere in the Gangetic Plains, and remain engaged in debates over land reform. There are also a number of initiatives which could facilitate more equitable access to groundwater for tenants. These include allowing tenants without legal papers to apply for groundwater irrigation, systems for collective ownership of equipment, and greater targeting of programs and policies towards the tenant farmer class.

Landlordism, Tenants and the Groundwater Sector: Lessons from Tarai-Madhesh, Nepal

Fraser Sugden

Introduction

Over the last decade, government development agencies across the Indo-Gangetic Plains have been shifting their focus towards the expansion of groundwater irrigation, particularly through shallow tube wells. In Nepal, this has arisen particularly as a result of the escalating costs, and concerns over the environmental and economic sustainability of large-scale surface irrigation schemes (Bhandari and Pandey 2006). Across South Asia, the expansion of groundwater use through shallow tube wells is argued to facilitate a decentralization of the provision of irrigation and it has allowed farmers to access water 'on demand', even in areas well beyond the command of conventional surface schemes (Shah 2006, 2007a). At the same time, it has been crucial in reducing vulnerability to drought and monsoon failures, and has facilitated an intensification of agriculture. While over-extraction of groundwater and declining volumes of aquifers remains a challenge across the Indo-Gangetic Plains, there are still areas where groundwater availability remains high and the potential has been underutilized, including the Nepal Tarai (Shah 2007a).

The focus of this report is not, however, to investigate issues of whether groundwater from shallow tube wells is available, but to look at the issue of groundwater access. There is some well-established scholarship on groundwater access issues in the eastern Indo-Gangetic Plains. Studies by Shah (2006, 2007b) have addressed the critical dilemma of rural energy supply for pumping, which is a challenge across the eastern Indo-Gangetic Plains in the context of diesel price rises. Research by Mukherji (2007) has explored the institutional constraints (and opportunities) in accessing the groundwater market, such as the need for familial ties to pump owners. Kishore

(2004) focused on the poor terms of trade for farmers in Bihar which discourages expenditure on prohibitively high diesel pumping, not to mention the stagnant levels of public investment in infrastructure and weak supporting services.

This report, however, seeks to better understand the constraints to the expansion of groundwater irrigation rooted in the agrarian structure itself. It is acknowledged in the literature that investment in shallow tube wells and pumping equipment in the eastern Indo-Gangetic Plains is out of reach for marginal producers, and they face similar financial barriers to 'purchasing' groundwater (Kishore 2004; Mukherji 2007; Mukherji et al. 2003). This is important as constraints linked to household economic status are higher for groundwater use than they are for accessing water from gravity fed sources, as groundwater generally requires significant monetary investment for the well and pumping equipment.

However, it is necessary to dig deeper to understand the production relations which lie behind these constraints and, in particular, the differences within the 'marginal' farmer group with respect to land tenure and their relation with other farmers. In Nepal, particularly in large parts of the plains, the farming populations are differentiated between those owning *and* cultivating most of their land, and those cultivating mostly as tenants. Aside from relations of surplus appropriation between farmers, whereby large farmers extract high rents, unequal class relations are also present between tenant farmers and urban-based landlords (Sugden and Gurung 2012). In the semi-feudal economic formation of the Eastern Gangetic Plains, where rent payments even eat into household subsistence needs (see

Bhaduri 1973; Sugden 2013), one's position in this complex web of landlord-tenant relations has a critical role in determining investment in, and access to, groundwater irrigation. It has been argued earlier that technocratic reforms will by no means undermine semi-feudalism in Nepal, which is reproduced on a political and economic level at multiple scales (Sugden 2013). Nevertheless, by better understanding the complexities of landlord-tenant relations, one can develop short-term

solutions which can strengthen the livelihoods and food security within the base of the agrarian structure.

This research report, therefore, seeks to identify the constraints and potential solutions faced by tenant farmers, in particular, in accessing groundwater. This includes the barriers they face in investing in groundwater technology or wells, as well as in accessing groundwater through water markets or cooperative formations.

Background

The Tarai or *Madhesh* of southern Nepal is a plains region with vast groundwater reserves, but comparatively limited expansion of shallow or deep tube wells. While the northern belt, the *bhabar*, is a forested alluvial slope of coarse gravels at the foot of the Churia range (the first Himalayan foothills), the plains tract further south is one of the most important agricultural-producing areas in Nepal where most of the lowland population resides. It is a region of significant cultural diversity with a sizeable *adivasi* (indigenous) population who resided in the formerly forested regions, and a large population of Maithili, Bhojpuri and Avadhi speaking communities with their own complex caste system who populate both sides of the Nepal-India border. Finally, there is a large population of settlers from the hills who have migrated to the Tarai over the last 60 years, particularly in the northern belt (Gaige 1976).

The Tarai faces considerable challenges to meet the subsistence needs of both its own population, and contribute to food security at a national level. The population of the region continues to grow with migration from the hills. While it was home to 48.4% of Nepal's population in the 2001 census, it had increased to 50.2% by 2011 (Central Bureau of Statistics 2012). Migration takes place to urban as well as rural areas, and the expansion of towns

will put further pressure on the availability of land for cultivation (Pant 2011). Meanwhile, in villages, the continued fragmentation of holdings and climate change is reducing food output at a household level. In this context, the dissemination of shallow tube well irrigation technologies is crucial to develop the productive forces and improve food security.

While groundwater extraction schemes using shallow tube wells had begun in the 1960s in the Tarai-Madhesh, larger-scale initiatives began in 1975 with the establishment of the Nepal Groundwater Resources Development Board (GWRDB) in 1976 (GWRDB 2012). They were responsible for assessing the areas of groundwater potential in the Tarai through geophysical surveys of aquifers, and the monitoring of sets of existing tube wells for changes in water levels and reserves.

As of 2006/2007, it is estimated that 726,000 hectares (ha) of land in the Tarai had good potential for shallow aquifer development and 305,000 ha with marginal potential (GWRDB 2012), with around 3,000 shallow tube well units being installed each year (Bhandari and Pandey 2006). However, while the Tarai-Madhesh is at the forefront of groundwater development in Nepal, the combination of a deeply entrenched caste system and a complex history of settlement make it a region with a highly stratified social

structure. It, therefore, makes it an ideal case study to explore the impact of landlord-tenant relations on groundwater uptake. This report sheds light on the dynamics of shallow tube well

use under semi-feudal conditions, with a focus on three districts in the western, central and eastern Tarai, namely Rupandehi, Dhanusha and Morang.

Methods

There are three main sources of data for this report. The first is analysis of secondary data, in particular, the Nepal National Sample Census of Agriculture. The second is data from a series of previous and ongoing studies in the eastern Tarai by the author, in particular, a detailed one and a half-year study of agrarian relations in Morang District in 2007-2008. The third source of data is 36 interviews and focus group discussions conducted during field visits to Morang, Dhanusha and Rupandehi districts between April and August 2012. Interviews were unstructured, and focused specifically on the dynamics of landlord-tenant relations and the different options for accessing groundwater, based on a set of key themes. Interviews were carried out with farmers from different socioeconomic groups, although the focus was on more marginal and tenant farmers. While it was originally planned to conduct separate interviews and focus group discussions, the difficulties controlling space within the community meant that individual household interviews often developed into focus group discussions as onlookers joined in. Finally, a quantitative survey was carried out in the same

VDCs¹ of Dhanusha and Morang as part of a separate IWMI study on the vulnerability to climate change, which was also integrated into this report to provide insights into tube well ownership and use by tenant farmers. This survey was carried out in Ekrahi and Thadi Jijha VDCs of Dhanusha, and Jhorahat, Bhaudaha and Thalaha VDCs of Morang.

As groundwater use amongst marginal and tenant farmers is still so limited, there was insufficient data from single villages to generate an overview of the diversity of issues². Therefore, an attempt was made to cover a wide range of villages³ across the south of each district – the region which traditionally has the highest levels of landlessness, as opposed to the more prosperous northern belts where much of the land is farmed by settlers from the hills with larger owner-cultivated holdings. The list of interviews conducted is displayed in Table 1, while their location is displayed in Figure 1. This list is by no means exhaustive as it excludes numerous informal interactions and conversations which took place in public locations, such as tea shops and village resting places.

¹ Village Development Committee (VDC) is the local unit of governance.

² In many villages, the number of operational tube wells was in single figures, making it difficult to generate broad conclusions.

³ Villages were selected according to the availability of local gatekeepers, while maintaining a geographical spread.

TABLE 1. Number of interviews/focus group discussions per VDC.

VDC	District	Number of interviews/focus group discussions
Bhaidaha	Morang	6
Sisabani Jahada	Morang	1
Baijnathpur	Morang	2
Kadmaha	Morang	2
Katahari	Morang	1
Dainiya	Morang	2
Giddha	Dhanusha	3
Ekrahi	Dhanusha	2
Phulgama	Dhanusha	1
Singhyahi Madan	Dhanusha	3
Dhabouli	Dhanusha	1
Godhegas	Dhanusha	2
Bangaha	Mahottari (bordering Dhanusha)	2
Lumbini	Rupandehi	3
Basantpur	Rupandehi	2
Chhipagad	Rupandehi	2
Hakui	Nawalparasi (bordering Rupandehi)	1
Total		36

FIGURE 1. Map of field sites and location within Nepal.



Existing Shallow Tube Well Programs in Three Districts

One of the first large-scale groundwater projects in the eastern and central Tarai, which encompasses Dhanusha and Morang districts, was the Community Shallow Tube well Irrigation Project (CSTIP) funded by the International Fund for Agricultural Development (IFAD) between 1994/1995 and 2000. Through easing access to tube well irrigation, it provided irrigation facilities for 4,855 ha of land in Sunsari, Saptari, Siraha, Sarlahi and Rautahat. In Rupandehi in the west, a number of government programs have been in place from the 1980s onwards under the support of the GWRDB. These include the Bhairawa-Lumbini Groundwater Project focusing on deep tube well irrigation, and the Nepal Irrigation Sector Project focusing on shallow as well as deep tube wells, both of which have been discontinued.

One of the first major projects in recent years which included all three districts was the APP Shallow Tube Well Program, linked to the targets of the 1996-2016 Agriculture Perspective Plan (APP), which placed considerable emphasis on promoting shallow tube well irrigation as part of its Tarai strategy (APROSC 1995). It established groundwater user groups, each with a minimum of three farmers, jointly cultivating a land area of at least 4 *bighas*⁴ (2.68 ha). Under the current phase of the project, however, farmers are provided the well, while purchasing the pump set remains the responsibility of the user group (interviews

conducted at Groundwater Development Office, Jaleshwar and Biratnagar)⁵.

Another ongoing project restricted to the eastern and central Tarai is the Deep Tube Well/Shallow Tube Well Irrigation project. The shallow tube well component was launched in 2007/2008 with support from India, beginning initially in Mahottari and Dhanusha, and later being expanded to other districts. At present, the government provides five wells for each 20 *bighas* (13.3 ha) of land area for free to interested user groups. In Morang, for example, it had covered 22 VDCs in the 2011/2012 financial year, installing 382 shallow tube wells (interview conducted at Groundwater Resources Development Board Office, Biratnagar).

A now discontinued project, which ran in parallel to the above-mentioned projects, was the Community Groundwater Irrigation Sector Project (CGISP) funded by the Asian Development Bank (ADB), which was established in 1997/1998 and focused on the central and eastern Tarai, including Dhanusha and Morang. It established user groups of up to four people for a 5 *bigha* (3.3 ha) command area, offering collateral free loans to groups. This was an integrated project, which also provided 2,800 m of road for each of the five tube wells installed in a VDC, while being linked to existing extension programs of the district agricultural offices.

⁴ *Bigha* is the most commonly used unit for land area. 1 *bigha* = 0.67 hectares.

⁵ There is also an associated APP Deep Tube Well project, although the focus now is on shallow tube wells. The deep tube wells irrigate a larger command area of up to 40 *bighas*, but they are considerably more expensive given their greater depth of more than 100 m.

The Evolution of Semi-feudal Agrarian Relations in the Tarai-Madhes

Early Land Relations

Before understanding the impact of tenancy on the success of groundwater development, it is useful to trace the origins of the present agrarian structure. The landownership structure in southern Morang, Dhanusha and Rupandehi is highly unequal, with a large population of marginal-owner cultivators and tenants at the base of the agrarian structure. Semi-feudal relations emerged from the era when the Tarai was first annexed by the Gorkhali regime, and the Shah and then Rana rulers distributed land grants to elites from the hills (Regmi 1976). Forested land was cleared by these settlers, particularly in Rupandehi and Morang, and indigenous communities, many of whom had once followed forest-based livelihoods, became tenants on these new *birta* estates which operated as semi-independent feudal vassals (Sugden 2013). At the same time, on the remaining lands, the new rulers gave tax collection responsibilities to elites from within the indigenous, Muslim and Hindu caste population of the plains, as well to nobles from the hills and even India. Functionaries were also encouraged to clear new estates in the forest and bring in cultivators from both the local population and from India. Throughout the nineteenth and early twentieth century these functionaries and land grant recipients emerged into two powerful, landowning classes (Regmi 1976, 1978; Sugden 2013).

Land Reforms

Following the overthrow of the Rana regime in 1950, there was a wave of land reforms under the short-lived multi-party government. Given the importance of agriculture in Nepal and the failure of agriculture to meet the needs of the population, reforms were seen as a first step to improve the conditions of the peasantry and it became an important political agenda (Alden-Wily et al. 2008; Regmi 1976). Reforms were continued under the partly-less *Panchayat* system from the 1960s to 1980s.

The most important ruling was the 1964 Land Related Act (Regmi 1976). The Act introduced ceilings on landholdings and sought to redistribute surplus land. A family was permitted to own no more than 25 *bighas* (16.75 ha) of agricultural land in the Tarai (inclusive of prescribed areas for residential purposes), while tenants were entitled to a maximum of 4 *bighas* (2.68 ha) for cultivation only (Sugden and Gurung 2012). Lands in excess were acquired by the government after payment of compensation, and surplus land was to be redistributed to the tenants or landless people (Regmi 1976). The Act also set agricultural rents at a maximum of 50% of the crop and made efforts to introduce formal tenancy rights (Adhikari 2006; Regmi 1976). Tenants were entitled to permanent tenancy rights on the agricultural land farmed by them and eviction was permitted only if they discontinued cultivation for more than a year, did anything to reduce the value or productivity of the land, or defaulted on rent payments.

The government had reportedly acquired approximately 50,000 ha of land by 1972. However, Regmi (1976) noted that this represented only 3% of the cultivable area and it was estimated that only 22,000 ha were actually redistributed, benefiting just 10,000 farmers. Despite the stated objectives, the 1964 Land Act and its subsequent amendments into the 1970s failed to create real changes in agrarian relations. Ceilings were weakly enforced, little land was redistributed and landlords rather than tenants often gained from the new rules (Alden-Wily et al. 2008). The program was not fully implemented due to a lack of cooperation between government departments, and a lack of clarity in administrative and bureaucratic practices, not to mention resistance by politically powerful landowners. Landlords were frequently able to avoid reforms using their political connections or deception to retain ownership of their holdings (Adhikari 2006, 2011; Alden-Wily et al. 2008; Deuja 2008). Joshi and Mason (2007, 404) estimated that, after the reforms of the 1960s, 3.3% of households in

Nepal still owned around 26.9% of arable land, while 62% of peasant households owned only 49% of the land in the country.

Given landlord-friendly rental legislations, which still entitled the landowner to half of the produce, land remained a profitable source of investment even following the land reforms. Growing prosperity in urban centers encouraged the purchases of land by town dwellers between the 1970s and 1990s⁶. In 1997, a fourth amendment to the 1964 Land Act eliminated dual ownership by offering registered tenants the right to 50% of the owners' land that they cultivate. Landlords, however, remained very reluctant to offer tenants official papers, while the government made few efforts to enforce these provisions (Alden-Wily et al. 2008).

The 2001 amendment to the Land Act further reduced the ceilings on landownership fixed in 1964, particularly given the pressure placed on the government by the People's War led by the Communist Party of Nepal (Maoist) (Joshi and Mason 2007). The amendment, once again, sought to regulate rents, although they remained at 50% of the main crop, while the provision entitling long-term tenants to half of the holdings was reiterated (Alden-Wily et al. 2008). However, due to pressure from opposition parties, the revised ceilings were not implemented (Nepali and Pyakuryal 2008). Similarly, regulation of rents were ineffective given that a large number of tenants remained unregistered, allowing landlords to effectively charge what they wished. According to the Nepal Population Census of 2001, 29.7% of households across Nepal were renting land or housing. However, this was three times the proportion of officially registered tenants, including those in urban areas, suggesting that the proportion of registered agricultural tenants would be even lower (Alden-Wily et al. 2008, 59).

When dealing with land officials, landlords have frequently denied there are tenants on their land, evicted them or classified them as farm laborers by 'hiring' them on a seasonal basis (Alden-Wily et al. 2008). Lack of tenancy rights

also prevents farmers from 'claiming' their share of the land after a set period of time. Alden Wily et al. (2008) reported that landlords often change tenants every few years, a process which is also going to reduce the likelihood that tenants will try to claim a share of the land.

The 2006 Comprehensive Peace Agreement (CPA) at the end of the People's War placed considerable emphasis on the need for significant land reforms (Alden-Wily et al. 2008), and it also figured in the Three Year Plan Approach Paper (2010-2013), which discusses the priority areas most relevant to Nepal's development (National Planning Commission 2010). Nevertheless, there has still been little progress in developing a concrete proposal, let alone implementing land reforms, and the long-established link between landownership and political power is likely to pose as a significant constraint to implementation today as it had in the 1960s (Sugden and Gurung 2012).

Absentee and Local Landlordism

Independent of these largely non-effective land reform legislations, two distinct patterns of change in landlord-tenant relations have emerged within the three districts over the last few decades. The first trajectory is evident in the regions with large *adivasi* (indigenous) populations (large parts of Morang and Rupandehi), and the second is present in the regions with a Maithili- or Bhojpuri-speaking Hindu caste majority (much of Dhanusha and western Rupandehi).

In the first domain, there has been a decline in the local landlord class over the last few decades, particularly with regards to those from the *adivasi* Tharu community, a topic covered in several recent papers, and the rise of an absentee landlord class (Sugden 2013; Sugden and Gurung 2012). Southern Morang and southwestern Rupandehi have high *adivasi* populations. In Madhuri and Birini in Rupandehi, interviews with elders revealed that some Tharu families who had 20-30 *bighas* (13-20 ha) in

⁶ Regmi (1976) termed this change as the rise of a 'non-ascriptive' landowning class, who were now sharing control over land resources with the traditional landed elite which over the generations had held 'ascriptive' rights to land. See Sugden and Gurung (2012) for more on this topic.

their name, had sold their land over the last 20 years due to indebtedness. Similar stories have been documented from Morang District, whereby Tharu and Rajbanshi landlords, who were once important tax collectors, had lost their political and economic power which was rooted in the now obsolete Rana agrarian bureaucracy (Sugden 2013). Many had sold land to politically connected urban dwellers due to indebtedness in the context of an increasingly monetized economy. The remaining holdings were reduced due to fragmentation amongst sons. A large number of smaller landholding peasants also sold or had land confiscated due to indebtedness to money lenders in cities, as well as outright deception.

Many of the growing absentee landlord class were the descendants of the more powerful administrators from the Rana period and *Birta* recipients who had avoided the land reforms. This group was mostly from the high castes in the hills, who had now migrated to urban centers and were working in the bureaucracy or other professional sectors. However, some landlords were also from a new class of urban landlords buying plots for speculative purposes, as well as for the additional income that can be gained from rent (Sugden 2013). The descendants of both types of landlord retain their estates in the countryside, yet often have only a limited interest in agriculture.

A consequence is that, within the *adivasi* belt of central and southeastern Rupandehi and southern Morang, there are entire villages that are home to indigenous cultivators, where a majority of the households are working as tenants for absentee landlords. The 2013 survey in Morang revealed that 73% of land in the sample was under tenancy. Across all three VDCs, tenants,

part-tenants and landless laborers represent 69% of the sample, while most of the remainder were owner cultivators. Large owner cultivators with more than 3 *bighas* (2 ha) of land are small in number, at just 4% of the sample, as the main landlord class is absentee and thus is not included in the sample (see Table 2). Of the rented land in the sample, three-quarters belong to absentee landlords.

In Rupandehi, there was no survey data available for the study villages, yet estimates given during a focus group discussion suggested that 70% of households in Birini and 71% in Mahuwari operate at least some of their land as tenants, again, mostly for absentee landlords with estates ranging from 5 to 20 *bighas* (approximately 3 to 13 ha).

Within the second cultural domain where people from the Hindu caste are predominant, the pattern of change has been somewhat different. In Dhanusha and parts of western Rupandehi, oral histories suggest there was a less pronounced shift in the landownership structure since the end of the Rana era. Powerful households from the local upper and middle castes⁷ held administrative positions under the Ranas, and continue to be important landowners today, with lower caste counterparts working for them as tenants or laborers. However, many of the more powerful landlords who had held high administrative roles had migrated to urban centers. Since the 1990s, many have been selling a lot of their land as it is deemed to hold little speculative value given the relative remoteness of these regions, and thus the absentee landlord class declined. This was intensified in the political instability following the beginning of the People's War in 1996.

TABLE 2. Comparing samples from selected communities in Morang and Dhanusha.

District	Part tenants (%)	Pure tenants (%)	Landless laborers (%)	Owner cultivators with > 0.5 ha (%)	Owner cultivators with < 0.5-2 ha (%)	Owner cultivators with < 2 ha (%)	Non-cultivator with land (%)
Dhanusha (2 VDCs)	23	3	15	26	20	9	4
Morang (3 VDCs)	23	16	30	12	13	2	4

⁷ Upper castes include the Brahmins, and middle castes include the Teli or Yadav.

Therefore, in western Rupandehi and Dhanusha, the landlord class is smaller, yet inequality remains high at a local level. A survey carried out in 2013 in two VDCs of Dhanusha, Ekrahi (included in this study) and Thadi Jijha (as part of a separate study), showed that the largest owner cultivators with more than 3 *bighas* (2 ha) represent only 9% of the total sample (see Table 2), yet they own 31% of the cultivated land. Two-thirds of this group were from the dominant middle and high castes. Of the sampled households, 36% were marginal owner cultivators with less than 1 *bigha* (0.67 ha), 24% were tenants or part tenants, and 11% were landless laborers. In Mahuwari in western Rupandehi, there was no survey data available, yet a significant 71% of households were estimated to be part tenants, with around 6% as pure tenants. Most land was reportedly rented from local large farmers, who had maximum holdings of up to 10 *bighas* (6 ha).

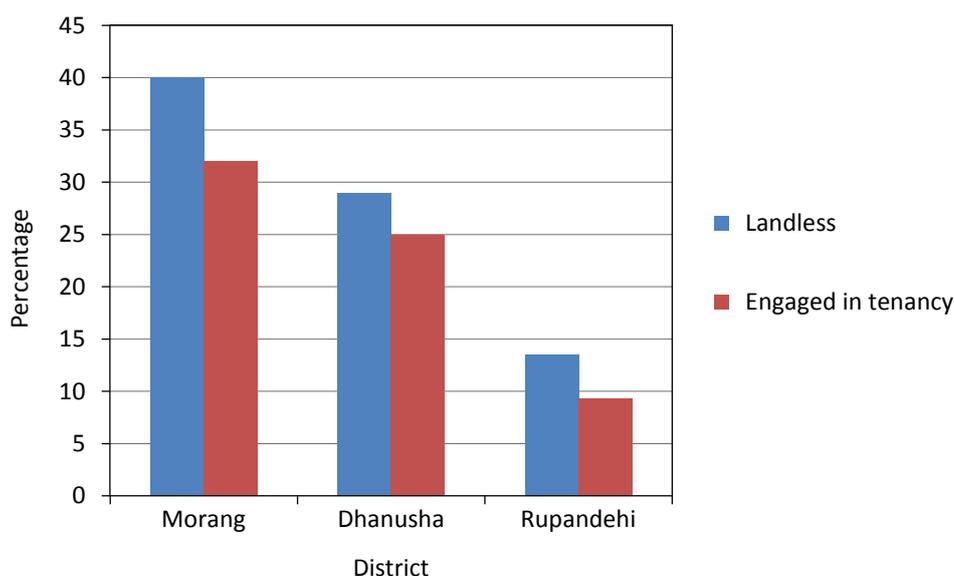
In sum, it appears that, in the communities where data was collected in southern Dhanusha and western Rupandehi, the landlords are mostly from the local dominant castes. The landholding size is not as large as their absentee counterparts, yet they still control a significant portion of the

land in each village. In the study sites in southern Morang and parts of eastern Rupandehi, on the other hand, most of the big landlords are absentee urban dwellers, and often hold much larger estates. It is also worth noting that, in all communities, rents are almost always paid in kind as a portion of the harvest. However, a fixed-rate rent is becoming more common in the regions with absentee landlordism, as it requires less supervision by the landlord, and sharecropping remains prevalent in areas where landlords are local. These findings are echoed in the study carried out by Shah et al. (2009) in India.

The Extent of the Problem: District-level Data

It is worth noting that the levels of tenancy and landlessness are not present across all of the three districts. The northern belt across the Tarai is home to wealthier owner cultivators who migrated from the hills, and in Rupandehi and Morang, they represent a significant portion of the population. Therefore, district-wise data show lower overall levels of tenancy, particularly in Rupandehi (Figure 2). Nevertheless, landlord-

FIGURE 2. Percentage of landless people and those engaged in tenancy in each of the three study districts.



Data sources: Landless people (census 2001); those engaged in tenancy (NSCA 2001/2002).

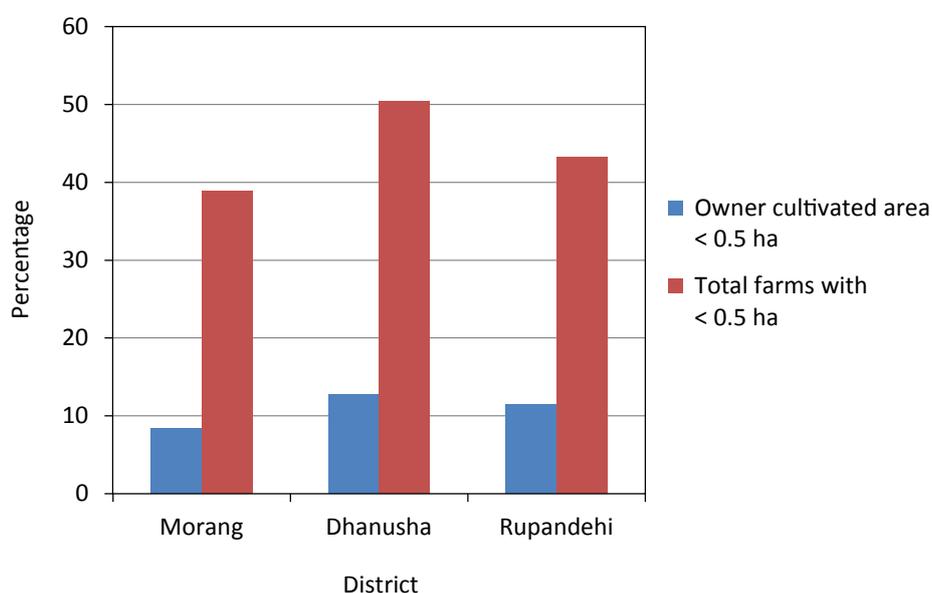
tenant relations are still widespread enough to be of considerable relevance to agrarian development. In Morang, a substantial 40% of households were shown to have no land in the 2001 census⁸, while the National Sample Census of Agriculture (NSCA) from 2001/2002⁹ recorded that 32% of the respondents rent some land either as pure or part tenants. In Dhanusha, the census records 29% landlessness, while the NSCA records that 25% of households are engaged in tenancy.

From the 2001/2002 NSCA, it is clear that across all three districts, the majority of owner cultivators are also marginal. In Morang, 39% of owner cultivators have landholdings of less than 0.5 ha, while this is 43% in Rupandehi (Figure 3). In Dhanusha, where there appears to be the greatest *local*-level inequality (local rather than absentee landlords), a substantial 50% of owner

cultivators own less than 0.5 ha. Many of these small owner cultivators also rent part of their holdings.

In all three districts, there is also considerable concentration of landholdings, although, again, this is highest in Dhanusha where 28% of the cultivated land is owned by just 5% of farmers operating holdings greater than 3 ha (Figure 4). Accepting that this data is more than a decade old, data collected locally suggested that large farmers nowadays increasingly prefer to give their excess land to tenants rather than cultivating it themselves. With the high cost of inputs and the increased risks posed by climate change, giving out land to poorer farmers on share tenancies is often preferred by large farmers. In this way, some of the costs, and thus the risks, are shared with the tenant, and their household capital and labor

FIGURE 3. Proportion of land cultivated by different farm size categories.

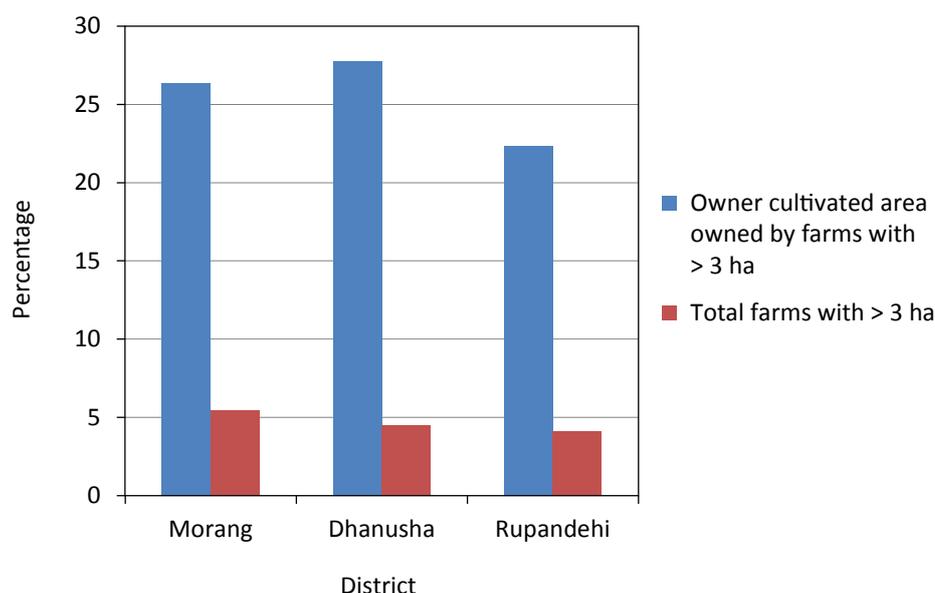


Data source: NSCA (2001).

⁸ Data on household landownership was not included in the 2011 census.

⁹ Results from the 2010/2011 survey are not yet available.

FIGURE 4. Proportion of land cultivated by different farm size categories.



Data source: NSCA (2001).

can be allocated to other sectors. This suggests that landlord-tenant relations may increase in the years to come. This corroborates the findings of Shah et al. (2009) from India, which suggest that rising costs of production are making independent cultivation less viable for many

households, and is one factor driving an increase in tenancy.

The extent of landlord-tenant relations and the different forms it takes has implications for groundwater development, as this report will go on to show.

Landlord-tenant Relations and Groundwater Development

Purchase of Shallow Tube Wells and Equity

Having established that land inequality and landlord-tenant relations are a significant issue, how does this affect the uptake of the shallow tube well technology? There are three primary ways in which groundwater is utilized by farmers in Morang, Dhanusha and Rupandehi districts. First, a household can bore their own shallow tube well and purchase a pump set. Second, they

can rent a well from other farmers. Similarly, if they own a well but no pump set, they can rent the pump. Third, tube wells and pump sets can be purchased *collectively* and water can be shared through a user group.

To begin an analysis of equity issues, it is useful to look at the distributional benefits of groundwater use. Unlike large-scale public irrigation systems, shallow tube well investment is the domain of atomized units of production, essentially the family farm (Shah 2006).

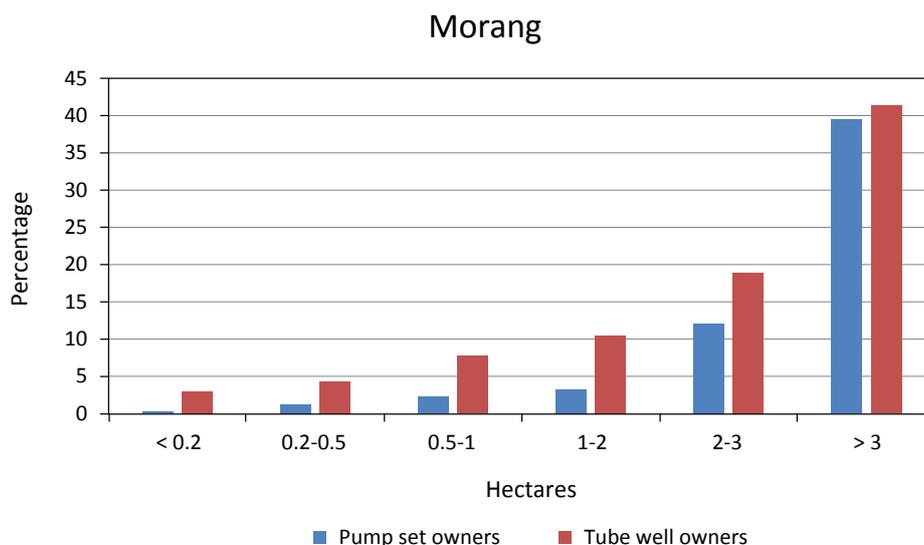
Consequently, the position of each household in the landownership structure has a critical impact on investment capacity. Expenditure on equipment and wells are by no means scale neutral. The 2001/2002 NSCA sample provides some insights into the influence of farm size on the type of irrigation used. Unfortunately, this data does not differentiate between households that operate land as tenants and those that are owner cultivators. Nevertheless, given that most rented plots were found to be less than 1.5 *bighas* (1 ha), and that many marginal farmers are also tenants, it remains a useful approximate measure.

As one would expect, the 2001/2002 NSCA data suggests that private ownership of shallow tube wells and pump sets is restricted to farmers operating much larger landholdings. In Morang, out of the farmers operating more than 3 ha, 41% own tube wells and 39% own pump sets (Figure 5). In Dhanusha, 27% and 30% of these large farmers own tube wells and pump sets, respectively (Figure 6). In Rupandehi, 33% of farmers with more than 3 ha own tube wells, with a substantial 58% owning pump sets (Figure 7).

It is clear that ownership of either tube wells or pump sets is extremely low for more marginal farmers operating less than 0.5 ha in all three districts, and ownership of pump sets is negligible.

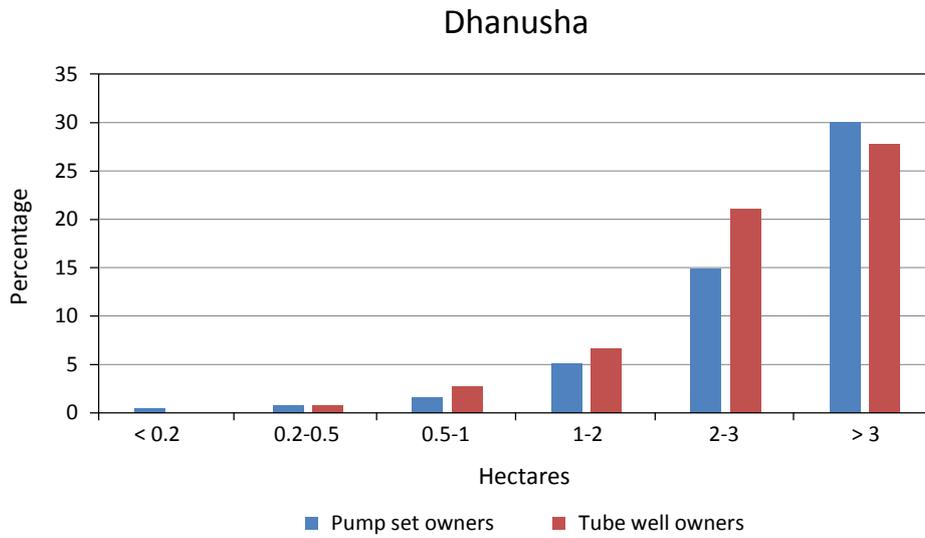
There are two primary reasons for marginal farmers not being able to bore wells or invest in a pump set. First, of course, is raising the capital to invest. The costs of boring a well can be considerable, and it varies according to the underlying geology. In Dhainiya of Morang, it costs from USD 180-200 to bore a well (interview conducted in Dhainiya); in Kambe of Lumbini VDC in Rupandehi, the cost was USD 700-800; and a few kilometers away in Mahuwari, it reportedly costs up to 1,500 as farmers have to dig beyond the clay layers to reach the deeper aquifer. Second, an equally significant expense is the purchasing of pumping equipment. Diesel pump sets can cost between USD 350 and USD 400. Therefore, boring a well and then purchasing the pumping equipment represents a significant capital investment that is only viable for farmers with larger landholdings who yield a significant surplus and profit from their land.

FIGURE 5. Ownership of agricultural equipment by farm size category in Morang.



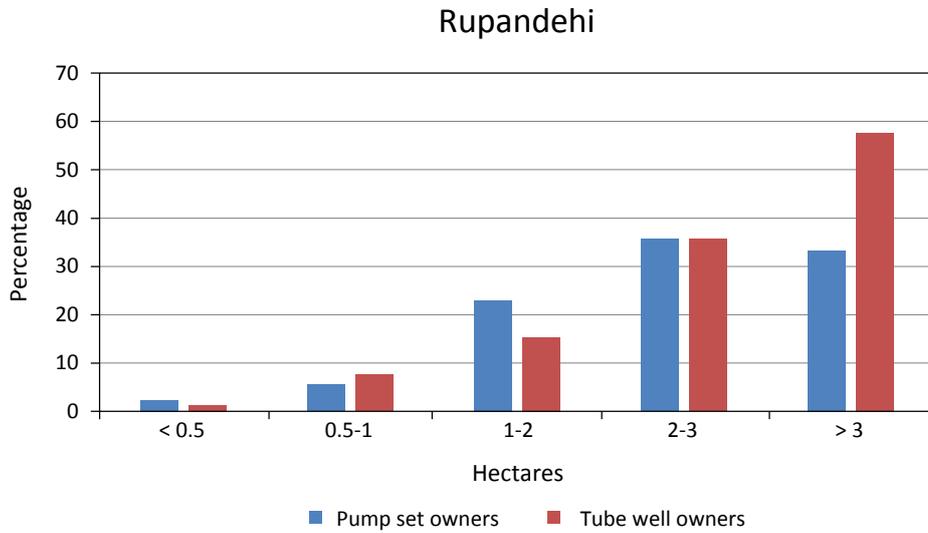
Data source: NSCA (2001).

FIGURE 6. Ownership of agricultural equipment by farm size category in Dhanusha.



Data source: NSCA (2001).

FIGURE 7. Ownership of shallow tube wells and pump sets by farm size category in Rupandehi.



Data source: NSCA (2001).

While the relationship between farm size and ownership of pump sets or tube wells is to be expected, more complex constraints rooted in the relations of production impede marginal farmers who are *tenants* from investing in such technologies. As one would expect, high rent payments mean that there is limited surplus produce which can be converted into cash to meet the necessary fixed costs. However, with regards to tube wells, in particular, tenants have few incentives to bore wells on land that does not belong to them, an issue which was brought up in nearly all interviews and focus group discussions. In Madhuri in Rupandehi, a village with high levels of tenancy, it was reported that only 15 have bored a well out of approximately 80 households. Any fixed investment is a considerable risk for tenants as they could be evicted from the land at any time. The 2013 survey carried out in two VDCs in Dhanusha and three VDCs in Morang produced similar results. Of the owner cultivators with more than 3 *bighas* (2 ha) of land, 19% own pump sets and wells, with only 12% owning wells. In contrast, only 5% of small owner cultivators with less than 1 *bigha* (0.67 ha), 9% of part-tenants and no pure tenants own either wells or pumps. In Morang, none of the tenants or part tenants and just 6% of owner cultivators had pump sets or wells (survey carried out by the author in 2013).

During a group discussion in Sitpur of Bhaudaha VDC in Morang, a Rajbanshi farmer who operated 3 *bighas* (2 ha) on a sharecropping (*adhiya* or *bataiya*) contract explained how 2 *bighas* (1.34 ha) of his land received a little water from a canal. Although he could potentially bore a tube well for a more reliable water supply, it was too big a risk to take as the landlord could cancel the tenancy given the oral nature of the contract. Although some tenant farmers who owned a well were encountered, all these farmers had at least a small plot of their own land where the well could be dug. However, even if a farmer owned a small plot where a well is a safe investment, one may not be able to irrigate rented plots using the same source if they are located far away.

This reluctance to bore wells is aggravated by the fact that most households that rent land do not have tenancy or *mohi* rights (Sugden and Gurung 2012). These are formal government-approved contracts for tenants to cultivate the land for a stipulated period. Landlords are, however, reluctant to provide these papers as government legislation in the past has allowed tenants to claim half of the land after farming it for a prescribed period of time (Adhikari 2006). Informal oral contracts mean that it is very hard for tenants to make legal claims to the land they farm. This parallels the study by Shah et al. (2009) across India, where government land regulations have simply led to a predominance of oral contracts, paradoxically undermining the rights of the farmers which these laws seek to protect.

In Bhaudaha and Sisabani Jahada VDCs in Morang, it was estimated that only 10% to 15% of households have tenancy rights. In the remote village of Hurhuriya in Thalaha VDC, this was estimated to be as low as 5%. Similar findings were evident across the studied villages in Dhanusha. In a focus group discussion held in Madhuri village in Rupandehi, it was reported that only one household in the community had an official tenancy contract; it was also apparent that some landlords in Birini to the east make a conscious decision to change tenants regularly. In this way, the tenants are less likely to claim any rights to the land. This, of course, acts as a further disincentive for farmers to invest in irrigation.

Interestingly, two different respondents from Dhanusha and Morang reported that, while landlords were more willing to give tenancy rights in the past, they have become more wary about this over the last 10-15 years. Farmers are more aware of their rights today, and landlords are afraid that tenants will be more vocal in making claims to half of the land they farm within a few years as per the legal provisions, if they can provide receipts of rent payments. Landlords' fears are worsened at a time when there is increased discussion in Kathmandu about a new round of land reforms (Sugden and Gurung 2012).

In this context, a number of tenants stated that they would only bore a well if the landlord takes the initiative to do this themselves. This begs the question of the likelihood of a landlord making such an investment. This may be possible in the case of *locally*-based landlords. For example, some large farmers have rented out land that they had previously cultivated themselves, and this is increasing as they seek to transfer the risk involved in the context of poor yields. In such contexts, tenants can benefit from any investments the landlords had made in the past, including the boring of tube wells. Not all local farmers who rent out land are well off; some are only medium cultivators who do this due to labor shortages, which often occurs due to the migration of family members. It is usually in their interests to increase production, so that they can retain a greater share of the produce (or increase rents in the case of fixed-rate contracts).

However, the incentives for the *absentee* landlords of Morang and Rupandehi to invest on the land are very limited. At present, land is not the primary source of income for both traditional and 'new' absentee landlord classes. The 'occupations' of absentee landlords listed in focus group discussions included high-level jobs in the bureaucracy, along the domain of landed classes. Some also had roles in the private sector, including

employment in banks or ownership of businesses, particularly in the travel and hospitality sector¹⁰. For such households, land is simply an additional source of income (or used for producing grain for home consumption) while also being retained for the social status associated with landownership, and the speculative value of the holdings (Sugden and Gurung 2012). It was reported that, in this context, landlords have little interest in agriculture.

Although some may have cultivated the land themselves in past generations, this was long before the expansion of the conventional shallow tube well technology, and thus tenants rarely benefit from investments made in the past.

In Madhuri of Rupandehi, a focus group discussion revealed that, out of 20 different absentee landlords, only three had taken the initiative to bore a well. Similarly, out of the farmers interviewed in Morang District, the author encountered only one instance of landlords boring a well for their tenants, and this was through the corrupt capture of benefits from a government scheme as shown in case study 1 (see Box 1). Farmers cultivating the estates of absentee landlords in Morang usually meet their landlords only once a year when they come to collect the rent. Often, in the case of fixed-rate *thekka* contracts, the landlord does not even visit the land, and the farmers have to take the grain produced to the *kantha* or grain merchant where the paddy will be measured and rent paid.

Box 1. Case study 1. Elite capture of land in tube well user groups.

Hari Sardar (pseudonym) from Bishnupur in Morang recalled that during his grandfather's time most of the indigenous Bantar community in the village had a plot of land which was sufficient to meet their subsistence needs. However, most households had lost their land due to indebtedness and deception, and were working as laborers and tenants at present. Hari lost his land to a powerful family from Biratnagar in the 1960s, after his father was cheated over the value of a loan. This same landlord took a lead in establishing a well through a government scheme which was supposed to be for the benefit of a group of local farmers – a so-called user group. However, once the well was built, the landlord took control of it and now uses it for his own purposes, mostly to irrigate 10 *bighas* of his land which is rented out to his own tenants. No other farmers, including tenants from other plots, are allowed to use it. Hari Sardar lamented that a lot of money comes in the name of Dalit empowerment, yet it is all siphoned away by the elites.

¹⁰ Interestingly, there were no reports of landlords being involved in productive sectors such as manufacturing.

Farmers joked that some wealthy landlords visit their land very rarely, and their estates are so large that even they do not know which plot of land is theirs. In this context, the potential for landlords to contribute to the costs of boring wells seems overly optimistic, and their attitude is often indifferent as shown in case study 2 (Box 2).

An alternative for tenants who cannot bore a well would be to purchase a pump set to extract water from wells belonging to other farmers. Again, however, given the high rent payments, the costs are prohibitive. Furthermore, without a reliable source of water they have control over, such an investment is risky. The priority for most households is to acquire a well (unless other water sources, such as a perennial river, are available) and only consider investment in pumping equipment. In Madhuri of Rupandehi, the focus group estimated that only 20 households engaged in tenancy owned a pump set, and this belonged mostly to those who have at least *some* land of their own. In fact, many marginal farmers with their own water source still have to rent pumps – a topic which will be discussed in the next section. A Rajbanshi farmer from Sitpur had invested USD 85 to dig a well on the 1.2 *bighas* of land he owned (0.8 ha). This well also irrigates 4 *bighas* (2.7 ha) of additional land his household has rented out. However, the pump, which would be a far more significant expense, is rented from a neighbor.

The Groundwater and Equipment Rental Market

While it is clear that ownership of tube wells is highly skewed, a question which remains is the other methods through which marginal and tenant farmers can access groundwater. Groundwater markets, whereby farmers rent tube wells or equipment, are argued to facilitate access to water for marginal farmers (Pant 2004; Singh 2007). Those who cannot bore their own tube well can purchase water from their wealthier counterparts, while those who own a well but no pump set can rent equipment. However, how efficiently do these markets operate, and how easy is it for marginal and tenant farmers to access them?

When deciding whether or not to rent a well and equipment, the potential for increased yields is often balanced out against the considerable expense and risk it entails. The expense is not so much in the well but in the equipment required to extract water. For example, the rental fee for a well is often marginal at just USD 0.05 per hour, while the rental fee for the pump set, including diesel, can be high and ranges from USD 2 to USD 4 per hour. Meanwhile, the rental of pumping equipment (not the well) is often the primary source of revenue for richer tube well owners. Under these arrangements, the well and pumping equipment are often rented out as a 'package', given that most marginal farmers own neither wells nor pump sets. In fact, in some villages, if a

Box 2. Case study 2. Indifference of absentee landlords.

Most of the indigenous Bantar community in Bhaudaha, Morang, are landless tenants, who lost their holdings to the feudal elite during the Rana times or to urban dwellers more recently. The majority of landlords are absentee, preferring fixed-rent *thekka* contracts where a prescribed payment of grain is received, as this requires limited supervision or time spent travelling to villages to monitor the harvest. However, this also means that investment in a well is not going to affect what they receive as rent, which would be the case for sharecropping contracts, and this means that landlords have few incentives to encourage investment. Rajesh Sardar (pseudonym) rents 2 *bighas* of land on a *thekka* contract from a landlord living in Biratnagar City. He recently asked the landlord for assistance to raise capital to buy a pump set and dig a well to improve productivity. The landlord was dismissive, stating that it was the farmer's responsibility to manage a pump or well if they required one, and that they should leave the land if they were unhappy so that it could be rented out to someone else.

farmer has a good relationship with a well owner, they will not be charged for the water as long as the latter's pumping equipment is used.

The groundwater and equipment rental costs, however, vary considerably from village to village, and this acts as a considerable constraint for marginal farmers. Table 3 provides a list of rental fees reported by selected farmers who were asked about their most recent crop. It shows that there is considerable variation in the cost of renting a tube well and pump set, even within a single VDC. A more detailed study is necessary to understand the pricing system. At least, provisionally, it appears that the cost depends on a number of factors, which are primarily rooted in power relations. If a farmer does not have their own tube well, the bargaining power for renting equipment is inevitably reduced. This is further reduced when groundwater use is not well developed in a locality, and there are few choices of wells to rent that are situated close to a farmer's field.

In southeastern Dhanusha, it was reported that negotiating the expense of the pump set (which is often owned by the same farmer who owns the well) can be challenging, particularly if the demand is high. In these contexts, pump owners can charge what the market will bear. According to Mukherji (2007), in the context of West Bengal, it is noted that prohibitively high investment costs in wells and equipment generate the conditions for rent-seeking, as only a few can afford the investment. As has been argued in the literature elsewhere on the eastern Indo-Gangetic Plains, rental of equipment or tube wells is by no means governed by the free hand of the market, and local monopolies can take shape (Bhandari and Pandey 2006), with rental of equipment being used to reproduce the power and surplus appropriation capacity of the landed classes (Wilson 2002).

Another reason costs vary relates to locally-specific factors such as the remoteness of villages. In Singya Madan, a remote VDC in eastern Dhanusha, it costs up to USD 3.1 per

TABLE 3. Rental costs per hour for a tube well with a diesel pump set, as identified from selected respondents that participated in qualitative interviews.

No.	VDC	District	Rental cost per hour (USD)	Owner of well
1	Bhaudaha	Morang	1.6	Other farmer
2	Bhaudaha	Morang	1.3	User group
3	Bhaudaha	Morang	2.1	Other farmer
4	Sisabani Jahada	Morang	2.1	User group
5	Amgachhi	Morang	1.6	User group
6	Dhabouli	Dhanusha	1.1	Other farmer
7	Phulgama	Dhanusha	2.1	Other farmer
8	Singhyahi Madan	Dhanusha	3.2	Other farmer
9	Bangaha	Mahottari	2.1	Other farmer
10	Thadi Jijha (Thadi village)	Dhanusha	3.2	Other farmer
11	Thadi Jijha (Jijha village)	Dhanusha	4.2	Other farmer
12	Basantpur	Rupandehi	2.6	Other farmer
13	Lumbini	Rupandehi	2.1	User group

hour to rent a well. Pump owners claimed this was because it was difficult to reach Janakpur City, especially in the wet season, and fuel costs are thus high due to the transportation difficulties. However, such claims could also be used by equipment owners to mask their monopoly pricing, given that there were few choices of wells or pumps to rent. Some farmers in similarly remote villages nearby appeared to be paying a lot less. Electric pump sets are a lot cheaper to use, and are lighter and more portable. However, due to frequent power cuts¹¹, they were not always effective and some areas are still not connected to the electric grid, which is a challenge across the Tarai-Madhesh (Kansakar 2006).

In the context of these high costs, field-level data suggested that tenant farmers have a reduced capacity to rent wells and equipment when compared to their owner cultivator counterparts – in the same way that they are reluctant to actually invest in such assets. In Morang, only 31% of tenants or part tenants had rented a pump set and tube well. In Dhanusha, this is higher, at 74%, yet the area of land irrigated and quantities of water used are likely to have been significantly lower. The survey, for example, showed that only 30% of the total land area belonging to tenants or part-tenants in Dhanusha was under groundwater irrigation over the last year at any one stage of production (see Table 4). In contrast, 60% of

the land belonging to owner cultivators with an area between 0.5 and 2 ha, and 34% of those with more than 2 ha was under groundwater irrigation¹². Similarly, only 9% of tenants or part tenants had cultivated wheat, which is entirely dependent on irrigation, as opposed to 25% of owner cultivators with less than 1 *bigha*, and 33% of large owner cultivators with more than 3 *bighas* (2 ha).

It is clear from the above data that groundwater use is more limited amongst tenant farmers. Furthermore, when the groundwater market is monopolistic, paying high fees to rent wells and equipment can reinforce local-level semi-feudal relations between tenants and a large farmer minority. This is particularly pertinent in Dhanusha and western Rupandehi where the primary landlord-tenant relations are between high and middle caste local landlords and rich farmers, and a lower caste marginal farmer and tenant class. The large farmers' class power is reproduced not only through ownership of land, but through control over pumping equipment and water sources. As noted above, in the context of declining harvests and high costs of production, some large farmers had actually ceased direct production and had instead rented out much of their land, while also investing in agricultural machinery *solely* to rent out land to others. After a fixed one-off investment, renting the

TABLE 4. Groundwater use by marginal farmers in the survey carried out in Thadhi Jijha and Ekrahi VDCs in Dhanusha.

Farm category	Total area of land under groundwater irrigation (ha)	Percentage of cultivated land area under groundwater irrigation	Percentage of households cultivating wheat in the last year
Tenant/part-tenant	9.8	30	9
Owner cultivator with < 0.5 ha	2.8	35	25
Owner cultivator with 0.5-2 ha	15.01	60	17
Owner cultivator with > 2 ha	9.88	34	33

¹¹ At the time the research was conducted, dry-season power cuts due to an energy crisis in Nepal were as high as 14 hours a day, increasing to 16 hours during some weeks.

¹² The apparently lower levels of overall groundwater use amongst the larger farmers of Dhanusha may be due to the fact that they will only irrigate a portion of their bigger farms, and also because they are more likely to have land with access to other forms of irrigation, such as canals.

pump offers an additional source of revenue alongside the share of the harvest provided by their tenants, while requiring no personal effort.

In the context of the constraints outlined above, some tenant farmers prefer to leave the land fallow during the dry season rather than investing in groundwater use. Instead, they engage in menial off-farm labor until the next monsoon (Box 3, Case study 3). The risks are worsened by the escalating costs of diesel which is necessary to pump water, and the increasingly erratic climate. For example, unseasonal heavy rains during the months of April and May of 2012 had ruined more than half of the wheat crop in some parts of Morang. In such contexts, tenant households appear to weigh up the risks of achieving a poor harvest and making a loss on their investment in both labor and inputs, on the one hand, and not being able to find work in the non-farm sector, on the other. It was reported by a number of tenants in Morang that the ideal solution was to combine tenant farming with non-farm employment. In other words, they work on their land up to a certain point, beyond which they prefer to provide labor to the non-farm sector, ideally in factories where the employment is most regular (see Sugden 2013).

It is worth noting that the likelihood of tenants allocating their resources in the non-farm sector during the dry season instead of irrigated agriculture is increased for those renting land on sharecropping contracts. The 2007-2008 study from Morang, covered in Sugden and Gurung (2012), has shown how sharecroppers, in particular, have considerably reduced incentives to invest in technologies that improve productivity, given that the landlord will retain half the amount for each unit of investment. However, for fixed-rent tenants, such as those renting land through the *thekka* system (and owner cultivators), the entire incremental product accrued from enhanced allocation of technologies, such as irrigation and labor, will be retained by the tiller. In this context, *thekka* farmers were more likely to pay to access groundwater to cultivate a dry-season crop of wheat or summer rice (Sugden and Gurung 2012).

The reduced incentives for sharecroppers to invest in the groundwater market can, however, be reduced if landlords contribute to the costs involved. Newbery (1975) suggested that encouraging innovation by sharecropping tenants is in the interest of the landlords, as they are able to make a profit from the increased revenue. It was, however, reported by sharecroppers during interviews conducted that, while landlords usually contribute to the costs of fertilizer and seeds, they rarely contribute to the costs of irrigation. Nevertheless, it was claimed that, if the land is very fertile, tenants can bargain with the landlords so that they will make some contribution towards the cost of irrigation as well as fertilizer. In Singya Madan village of Dhanusha, sharecropping farmers renting land from local landlords did, in some instances, receive half the money for irrigation as well as for fertilizer and seeds (see Box 3, Case study 3), which made the cultivation of a dry-season crop more attractive. However, in this village, most of the landlords were *local*, so it was in their interest to encourage improved productivity. As noted above, not all the farmers renting out land are well off, and some of the lessees in Singya Madan were female-headed households whose male family members had migrated. In these contexts, it is understandable that landlords would want to invest to increase their share of the harvest.

However, in the case of Morang, the 2007-2008 survey revealed no evidence of *absentee* landlords contributing to the costs of irrigation. Three-quarters of the landlords were absentee and were themselves quite wealthy, with limited interest in the hassles and risks of supervising investments on their own farms. Even farmers on sharecropping contracts were, in all instances, expected to pay for the use of tube well irrigation. This, again, reminds one that the nature of the landlord-tenant relationship affects the efforts to develop shallow tube well irrigation.

Another disincentive for poorer households to rent tube wells and equipment, which is relevant to tenants and small owner cultivators alike, relates to the amount of water they will receive. The study by Bhandari and Pandey (2006) from the Nepal Tarai noted that groundwater 'buyers'

Box 3. Case study 3. Managing costs of wells and equipment in Dhanusha.

Singhya Madan VDC is located in a remote corner of Dhanusha District on the edge of the Kamala River. There were large floods in the village in 2003, and large tracts of land were inundated. Today, farmers perceived that the rice harvest is poor due to the high amount of coarse sediment deposited in the soil, although the yields for wheat are better. It was estimated that nearly three-quarters of the Dalit Pashwan community had no agricultural land, and many work as tenants for local farmers with excess holdings, with additional income from migrant remittances or menial wage labor. They reported that to harvest wheat they would need to pay at least USD 6.3 for each *katha* (0.034 ha) of land to rent a tube well and pump set. Many households are heavily indebted already, having taken loans to send family members abroad. The cost of renting a well and equipment was considered too high for many of these tenants, and some preferred to invest their time and labor working elsewhere, such as in the fields of farmers over the river in Siraha District. Occasionally, local landlords would, however, contribute to the cost of irrigation.

often receive irrigation water from a well only *after* the owner has irrigated his or her land. The tube well owner has greater control over where they can irrigate their land, and thus can benefit from a greater quality and quantity of irrigation water, unlike their counterparts who rent wells. The study based on data from Sarlahi and Banke shows that the average yield of shallow tube well owners was 25% higher than those who rent wells, and 86% higher than rainfed farmers. The net benefit was calculated to be USD 50 higher for tube well owners when compared to water purchasers. Similarly, in the study by Mukherji (2007) from West Bengal, it was noted that there were large differences in productivity between water buyers and water sellers, and kinship ties were a prerequisite to buying water when wells are owned and operated by an extended family group.

Also, in Madhuri village of Rupandehi, respondents noted how the water is often not available when required, if they are renting using a water source belonging to another farmer. The well owners will prioritize their own lands first if the demand for water is high, for example, during a drought. There is also competition sometimes from more than one renting farmer, and whether one can rent a well or access water in a timely manner often depends on the relationship one has with the well owner. Without such a relationship one may have to wait until other farmers have had their turn before they can use the well. These relationships also affect the cost. While

some farmers would rent out pump sets but give the well free, at other times they would expect a small payment of approximately USD 0.21 per hour to use the well on top of what is paid for the pumping machinery. This highlights that even if a farmer has to rent an expensive pump set, having their own tube well will at least ensure they have access to sufficient water in a timely manner.

A final disincentive to renting tube wells or equipment is scattered holdings. While it was common even for large landowners to own several plots in geographically dispersed locations, the problem appeared particularly acute for tenants who must often rent several very small plots from several landlords in order to meet their subsistence needs. One Dalit farmer in Singya Madan of Dhanusha noted how he owns 2 *katha* in one location, then rents separate plots of 1.5 *katha* from a farmer from the Mallah caste, 18 *katha* from a Mahato farmer, and another 4 *katha* from a Thakur family. All the plots are spread across different locations, so he cannot easily irrigate the land, with the exception of a field by a river where a pump is rented for USD 2.1 per hour.

Groundwater markets have been argued to address the problem of lack of consolidated holdings, as it can allow a farmer to rent multiple water sources belonging to different farmers (Pant 2004). However, this is dependent upon there being a well-developed groundwater sector, with a sufficient spread of tube wells to cover each plot of land. In villages where groundwater extraction

is not well developed, such as Mahuwari, the lack of any well in the vicinity of one's plot is a barrier to utilizing the groundwater market. Here, the underlying geology has made groundwater extraction difficult, and the few wells in the village are poorly functioning. Most water is extracted from a nearby pond and river using a pump set, and this can only irrigate fields located close to these sources. Furthermore, even if there are wells available, farmers in Dhanusha complained that the heavy diesel pump sets are not easily transportable. Frequent moving of equipment reduces their life span and increases maintenance costs. For this reason, pump owners are sometimes reluctant to regularly move the equipment long distances to the vicinity of a well where it is needed.

Collective Use of Groundwater

While it is clear that there are problems with the groundwater market, a remaining question relates to the utility of user groups in facilitating access to groundwater for marginal farmers and tenants. Collective ownership and management of pump irrigation systems are appropriate when small landholdings in the context of high boring costs make individual ownership unviable (Shah and Bhattacharya 1994). Government-run tube wells present a model of collective use which has been examined in the context of India. Such wells were found to be less viable due to bureaucratic constraints and high potential for land capture by elite and wealthy farmers. However, when infrastructure has been collectively run by relatively autonomous user groups, the reports from the literature have been generally positive (Rao 1995; Shah et al. 1994; Shah and Bhattacharya 1994).¹³

This latter model is by far the most common form of collective groundwater use in Nepal today, and involves a group of farmers forming a committee and pooling resources to install a

well which is normally installed through various government programs. The members then cultivate the land according to their needs as before, while simply paying a maintenance fee for the well and the pump. In many cases, a portion of the cost is paid by the government project initiating the boring of wells. In the case of the recent Shallow Tube Well Irrigation project of the government, the GWRDB provided the entire cost of the wells while the user group was responsible for acquiring the pump. In Bhaudaha village of Morang, for example, there were four to five user groups collectively owning wells, each with 22-25 people, while 6 private farmers owned wells. Usually, non-members can also use the well on payment of a fee. The farmer who uses the well for his land is basically responsible to pay whatever it costs to rent the pump set. On top of this, they have to give USD 0.05 to the group to cover for any maintenance costs of the well. It irrigates around 4 ha, which is the limit for a shallow tube well in the area, and benefits a large number of households which have very small plots of land of less than 0.3 ha, including several tenants.

Collective use of tube wells represents a significant opportunity for marginal and tenant farmers who cannot establish wells on their own land. Nevertheless, there are a number of lingering challenges. To begin, many 'committees' have a short life span, creating constraints when it comes to maintenance of the wells or equipment.

There are, however, deeper constraints. First, while a user group may allow farmers to collectively bore a well for free, only some groups had pooled their resources to purchase a pump set. Often, tenants may be the member of a groundwater user group while still having to rent a pump from rich farmers at a high price. For most marginal tenants, this remains a considerable expense, although access to their own well at least offers a more reliable source of water and can increase their bargaining power with respect to the cost of running the pump (they are not dependent on using the pump owner's well).

¹³ See also MacCarl (2013) for a more detailed discussion on the groundwater user groups in Morang and Dhanusha of Nepal.

Second, a more significant challenge to collective groundwater use lies in the agrarian structure itself. Accessing groundwater through government initiatives is a particular challenge if one does not own land in the area where one wants to irrigate, as shown in MacCarl (2013). In order to register a user group and apply for a well, an organized group of farmers needs to establish a committee and travel together to the government's GWRDB regional office. It is, however, the responsibility of landlords to group together to fill in the paperwork for a set area of land. If the tenant has no land of their own, or owns land in a different location from the rented plot they want to irrigate, they cannot apply on their own. With the limited interest of many landlords, particularly those who are absentee, this is a significant barrier to benefitting from these programs. Tenant farmers in Chhipagad of Rupandehi, for example, complained that they would like to apply for a well, but their urban-based landlords were not interested.

Third, another challenge relates to the elite capture of land by more powerful farmers. The study by Shah and Bhattacharya (1994) from Gujarat suggested that a possible cause of the poor performance of tube well cooperatives was that large farmers can create user groups to access tube wells at a subsidized rate, which are then privatized for personal gain, while retaining the veneer of a cooperative. Indeed, one common form of manipulation noted in Dhanusha included individuals forming 'fake' user groups, which usually entailed individuals collecting signatures from users, and then treating the well as their own private property (see Box 3, case study 3). In one village, there was anger that a user group leader and wealthier farmer had applied to a government scheme to bore a well in the name of a user group, yet when the well was built, he used it mostly for his own needs and other group members did not get a fair share of the water. There was a perception that there was some kind of corrupt nexus between a local micro-finance bank and the user group leader. The group had collectively contributed around USD 700 for the pump set and a maintenance fund in the bank. However, it was reported that the maintenance

fund held in the bank is hardly ever released when it is needed, causing them to suspect that funds were being siphoned off.

There was another incident in the same village of Dhanusha where a 'group' was present, but all members came from the same production unit. There was a rule in that program that there should be a minimum of four members in each group for each 4 *bighas* (2.7 ha) of land. However, the father, brothers and wife of a single household applied as a 'group', so they could get a free tube well installed through the government scheme. When the well is built, it basically belonged to one household and the others had to pay a rental fee. There was anger that benefits of a recent NGO intervention were also captured by the same local elites. When they came to the village, some *dalals* (middlemen) influenced the staff in their decisions regarding who to support. They ended up providing support to a group of influential residents.

In Rupandehi, there were some more indirect forms of elite land capture encountered. For each ward, there is a 'quota' for receiving free boring of wells from the GWRDB. In each ward, just five wells are provided in each season. Once the quota has been filled, the residents must wait for the next season until they can be considered for any other wells. As a result, there is competition. In both Hakui and Birini, it was reported that farmers with political influence sometimes get priority in applications for a well.

Fourth, another significant factor that affects the poorest households' capacity to benefit from interventions promoting collective groundwater use is the selective way in which they are spread geographically. It did not appear that government-led opportunities for subsidized installation of wells were widely publicized. In order to register a user group and apply for a well, an organized group of farmers needs to establish a committee and travel together to the GWRDB office in Biratnagar (for Morang), Jaleswor (for Dhanusha) or Butwal (for Rupandehi). Even if farmers are aware of the program, such a journey is not always an easy undertaking, particularly in remote VDCs. The time, paperwork and resources consumed in applying to form a tube well cooperative was

noted as a considerable constraint in the study carried out by Shah and Bhattacharya (1994), meaning that forming an informal tube well 'company' was a more practical option, even though it meant farmers did not receive subsidized infrastructure.

In this context, it appeared that it was normally through local connections and social networks that user groups would receive support. For example, a significant number of the 65 tube wells were built in Amgachhi VDC of Morang under a government program. It was reportedly easier for farmers in the area as an employee from the groundwater office is from that VDC. Five to seven years ago, the employee informed the farmers in advance, so they knew the process and user groups had their application ready by the time the project started. They even received a machine for free. However, in neighboring Dhainiya VDC there was no leader to organize the farmers. The farmers were discontented that they were too late to receive a free pump set, a privilege only provided under the earlier programs which had now been discontinued.

Similarly, in a Phulgama of Dhanusha, one of the local people had contact with a local NGO. Through them, they learned of the APP shallow tube well program. Two to three people then went to Jaleswor to submit an application. The village

eventually received NPR 800,000 worth of support for 20 user groups. A total of 100 households benefitted from the project, which is around 90% of households in the village. Only around 10% were left out, as their land was beyond the reach of the wells. It is worth noting that, in this village, almost all households were from the relatively better-off Yadav community, and reportedly almost all had their own land with holdings of 1 ha or above, on average.

However, villages home to marginal cultivators and traditionally excluded communities were often inadvertently sidelined. In villages such as Sitpur of Bhaudaha in Morang, almost all the farmers are marginal sharecroppers from the Rajbanshi and Bantar ethnic groups. In such communities, access to social networks are more limited, and there are fewer well-educated 'leader farmers' with connections to the bureaucracy and knowledge of the latest opportunities. As one would expect, there were few groundwater interventions with only a few wells in the village, both of which were private. A similar example is Singya Madan VDC of Dhanusha. Most households are sharecroppers or very small landholders with a large Dalit majority. There were reportedly no user groups in the villages which were visited, and only a few richer farmers had pump sets or wells and rented them out.

Conclusions and Recommendations

In light of the challenges stated in this report, it is clear that the constraints to developing the productive forces of agriculture through shallow tube well irrigation are deeply entrenched in the agrarian structure. In particular, landlord-tenant relations undermine the capacity of tenants to invest in a well or pump set. At the same time, the marginal economic status of tenants makes renting equipment and wells prohibitively expensive, particularly when pump rental is used by rich farmers to enhance their own economic

status. Collective ownership of wells offers some opportunities, yet the inability for landless tenants to register groups, elite land capture in the context of a stratified society and limited knowledge of programs limit the success of initiatives.

In the long term, radical land reforms are the only solution which can potentially facilitate sustained groundwater-led growth in agricultural productivity, including a strict regulation of ceilings and control of absentee landlordism. Even mid-way solutions, such as tenancy law reforms, may

not be a solution as warned by Shah et al. (2009), as it may give landlords a greater incentive to conceal and informalize contracts, further undermining the rights of tenants. However, any redistributive reform appears extremely unlikely in the current political climate, whereby landlords are themselves well embedded within Nepal's political and bureaucratic apparatus (Alden-Wily et al. 2008).

Furthermore, land reform itself may strengthen livelihoods initially, but natural differentiation between richer and poorer cultivators may well increase inequality again over the longer term, particularly when one considers the rising costs of production and climate stress which is driving 'distress sales' of land (Sugden et al. 2014). The demand for tenancy will, therefore, remain unless there is a radical transformation of the Nepalese economy, which will draw marginal farmers out of agriculture (Sugden and Gurung 2012). The capitalist industrial sector and informal urban employment is by no means developed well enough for this to occur at present. A radical change is unlikely to occur without a transformation of Nepal's economic structure; in particular, its dependence upon imports and weak position in the regional political economy has impeded the organic development of a capitalist industry (Blaikie et al. 2001).

There are, however, a number of short-term solutions which can at least facilitate the capacity of marginal and tenant farmers to access groundwater. The model of collective tube well ownership is promising, although a new approach is needed. First, a change is necessary in the process for distributing subsidized wells by the government, which would allow tenants without legal papers to still apply collectively as the tillers of the land¹⁴. A longer-term solution would be to encourage active investment by landlords. While this may be possible for local landlords, it appears unlikely to happen without eradicating absentee landlordism.

Second, government groundwater development schemes should move from a focus of providing subsidized or free tube wells alone to an integrated approach, which ensures user groups also have access to pumping equipment, which is where most of the costs lie. Indeed, many collective groundwater use schemes reviewed in the literature from India have entailed the provision of a combined package of a tube well with a fixed pump set (Pant 1994; Rao 1995; Shah et al. 1994; Shah and Bhattacharya 1994). A new set of programs should provide low-cost pump sets and tube wells to groups, with appropriate forward linkages for users (e.g., supply of parts and maintenance). Research is necessary to identify the most appropriate low-cost pumping options, including solar pumps, although there is a lot of work to be done in this sector before these become viable on a large scale. Distribution of pump sets should be focused explicitly on tenants or marginal farmers, and there should be an option for groups of tenants to collectively lease a pump on its own (not fixed to a tube well). This would allow them to extract water from other households' wells (which usually entails only a marginal charge) or pump from surface water bodies such as ponds. Such pump sets would need to be mobile, as it would ensure members of the committee would still benefit if they are obliged to move to a new plot, not to mention the fact that the user groups' plots may be scattered in different locations. Furthermore, groups of pump owners must be trained in the operation and maintenance of the equipment, and appropriate credit arrangements should be developed to allow groups to invest their own financial resources in the joint investment, and thus feel a sense of ownership.

Third, while it is important to target marginal farmers with subsidized equipment or boring of wells, it is important to do so in a way which promotes collective action. The process of

¹⁴ A database of tenants in a community (formal and informal) could potentially be created by an appropriate local unit of government (e.g., VDC) or by groundwater project staff to ensure there is no misuse of the system (e.g., creation of fake user groups by private individuals).

applying for government support by a user group must be simplified, and some degree of capital investment in proportion to one's share in the company, determined by level of use (i.e., operated holding) may increase the effectiveness of committees. The findings of Shah and Bhattacharya (1994) on tube well 'companies' in Gujarat suggest that this gives members of user groups a greater sense of 'ownership' and an incentive to maximize use of the equipment. There should also be a system in place which allows tenants to recover some of their investment by selling and transferring their 'share' in the user group to others, should they be obliged to give up their tenancy.

Furthermore, and on a related note, the appointment of a tube well or pump set 'operator' within each user committee could ensure that the equipment and/or tube well is maintained, and that water is distributed fairly. So long as they are carefully appointed, this would reduce the likelihood of elite capture whereby user group leaders give themselves priority. In the study by Pant (1994) from Uttar Pradesh, this role was

taken up by the committee secretary. The study by Rao (1995) of *Panchayat Samiti*-run tube wells in West Bengal demonstrates how an appointed 'operator' receives a small commission for their work, and are responsible for allocating water, maintaining bills, collecting pumping charges according to use and supplying water to non-members if surplus is available. It was suggested that such operators could even be employed to look after several tube wells, if employing one for a single committee is not viable.

Groundwater access will remain a considerable challenge in the deeply stratified social formation of the eastern Tarai in the years to come. It is critical for scholars to continue to engage with both short-term solutions which lie in the format of groundwater programs themselves, including the development of appropriate and sustainable technologies, and institutional arrangements which are appropriate to the needs of marginal and tenant farmers. It is also critical, however, not to lose site of the longer-term solutions, addressing the social structures which create these access barriers in the first place.

References

- Adhikari, J. 2006. *Land reform in Nepal: Problems and prospects*. Kathmandu, Nepal: Institute of Development Studies.
- Adhikari, J. 2011. Contentions and prospects of land reform in Nepal: A historical review. *New Angle: Nepal Journal of Social Science and Public Policy* 1: 17-31.
- Alden-Wily, L.; Chapagain, D.; Sharma, S. 2008. *Land reform in Nepal: Where is it coming from and where is it going?* Kathmandu, Nepal: Department for International Development (UK) (DFID).
- APROSC (Agricultural Projects Services Centre). 1995. *Nepal agriculture perspective plan*. Kathmandu, Nepal: Agricultural Projects Services Centre (APROSC); Washington, DC: John Mellor Associates Inc.
- Bhaduri, A. 1973. A study in agricultural backwardness under semi-feudalism. *The Economic Journal* 83: 120-137.
- Bhandari, H.; Pandey, S. 2006. Economics of groundwater irrigation in Nepal: Some farm-level evidences. *Journal of Agricultural and Applied Economics* 38: 185-199.
- Blaikie, P.; Cameron, J.; Seddon, D. 2001. *Nepal in crisis: Growth and stagnation at the periphery. Revised and enlarged edition*. New Delhi, India: Adroit Publishers.
- Central Bureau of Statistics. 2012. *Preliminary report of the national population census 2011*. Kathmandu, Nepal: Central Bureau of Statistics, National Planning Commission Secretariat, Government of Nepal.
- Deuja, J. 2008. Landlessness in Nepal. In: *Land, politics and conflict in Nepal: Realities and potentials for agrarian transformation*, eds., Upreti, B.; Sharma, S.R.; Basnet, J. Kathmandu, Nepal: Community Self Reliance Centre; South Asia Regional Coordination Office of National Centre of Competence in Research (NCCR) North-South; Human and Natural Resources Study Centre, Kathmandu University. Pp. 245-258.
- Gaige, F. 1976. *Regionalism and national unity in Nepal*. Berkeley: University of California Press.
- GWRDB (Groundwater Resources Development Board). 2012. About us. Groundwater Resources Development Board (GWRDB), Ministry of Irrigation, Government of Nepal. Available at http://www.gwrdb.gov.np/about_us.php (accessed on November 19, 2014).
- Joshi, M.; Mason, T.D. 2007. Land tenure, democracy, and insurgency in Nepal: Peasant support for insurgency versus democracy. *Asian Survey* 47: 393-414.
- Kansakar, D.R. 2006. Understanding groundwater for proper utilization and management in Nepal. In: *Proceedings of IWMI-IITP-NIH International Workshop on Creating Synergy between Groundwater Research and Management in South and Southeast Asia, Roorkee, India, February 8-9, 2005*, eds., Sharma, B.R.; Vilholth, K.G.; Sharma, K.D. Pp. 95-104.
- Kishore, A. 2004. Understanding agrarian impasse in Bihar. *Economic and Political Weekly* 39: 3484-3491.
- MacCarl, B. 2013. *From plump to pump: Land, wealth and inequality in Nepal's groundwater irrigation strategy*. MSc Thesis. Colombo, Sri Lanka: International Water Management Institute (IWMI); and Australia: University of Queensland.
- Mukherji, A. 2007. Implications of alternative institutional arrangements in groundwater sharing: Evidence from West Bengal. *Economic and Political Weekly* 42: 2543-2551.
- Mukherji, A.; Ballabh, V.; Choudhary, K.; Pandey, S.; Mishra, S. 2003. *Groundwater development and agrarian change in Eastern India*. IWMI-Tata Comment 9. Gujarat, India: IWMI-Tata Water Policy Program.
- National Planning Commission. 2010. *Three year plan approach paper (2010/11-2012/13)*. Kathmandu, Nepal: National Planning Commission, Government of Nepal.
- Nepali, P.; Pyakuryal, K.N. 2008. Land and power relations. In: *Land, politics and conflict in Nepal: Realities and potentials for agrarian transformation*, eds., Upreti, B.R.; Sharma, S.R.; Basnet, J. Kathmandu, Nepal: Community Self Reliance Centre; South Asia Regional Coordination Office of National Centre of Competence in Research (NCCR) North-South; Human and Natural Resources Study Centre. Pp. 99-125.

- Newbery, D.M.G. 1975. Tenurial obstacles to innovation. *Journal of Development Studies* 11: 263-277.
- Pant, B.D. 2011. *Soaring food prices in Nepal: Causes and consequences*. Kathmandu, Nepal: Institute for Integrated Development Studies (IIDS).
- Pant, N. 1994. *The turnover of public tubewells in Uttar Pradesh: A case study of a successful cooperative society*. Paper presented at the International Conference on Irrigation Management Transfer, September 20-24, 1994, Wuhan, China.
- Pant, N. 2004. Trends in groundwater irrigation in eastern and western UP. *Economic and Political Weekly* 39: 3463-3468.
- Rao, D.S.K. 1995. Farmer management of public tubewells in West Bengal. *Economic and Political Weekly* 30(39): A117-A122.
- Regmi, M. 1976. *Landownership in Nepal*. New Delhi, India: Adroit Publishers.
- Regmi, M. 1978. *Land tenure and taxation in Nepal*. New Delhi, India: Bibliotheca Himalaya.
- Shah, T. 2006. The irrigation economy of the Indo-Gangetic Basin: In the throes of a transition. In: *Water for irrigated agriculture and the environment: Finding a flow for all. Proceedings of ATSE Crawford Fund Conference, held at Parliament House, Canberra, Australia, August 16, 2006*, ed., Brown, A.G. Session: Balancing the demands for agriculture and the environment: World best practices or disasters? Pp. 49-54.
- Shah, T. 2007a. The groundwater economy of South Asia: An assessment of size, significance and socio-ecological Impacts. In: *The agricultural groundwater revolution: Opportunities and threats to development*, eds., Giordano, M.; Villholth, K.G. Wallingford, UK: CABI. (Comprehensive Assessment of Water Management in Agriculture Series 3). Pp. 7-36.
- Shah, T. 2007b. Issues in reforming informal water economies of low-income countries: Examples from India and elsewhere. In: *Community-based water law and water resource management reform in developing countries*, eds., van Koppen, B.; Giordano, M.; Butterworth, J. Wallingford, UK: CABI. (Comprehensive Assessment of Water Management in Agriculture Series 5). Pp. 65-95.
- Shah, T.; Ballabh, V.; Dobrial, K.; Talati, J. 1994. *Turnover of state tube wells to farmer cooperatives: Assessment of Gujarat's experience, India*. Paper presented at the International Conference on Irrigation Management Transfer, September 20-24, 1994, Wuhan, China. Draft conference papers Vol. 1. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI); Wuhan, China: Wuhan University of Hydraulic and Electrical Engineering. Pp. 229-243.
- Shah, T.; Bhattacharya, S. 1994. *Farmer organisations for lift irrigation: Irrigation companies and tubewell cooperatives of Gujarat*. London, UK: Overseas Development Institute (ODI), Irrigation Management Network. 28p. (ODI Network Paper 26).
- Shah, T.; Indu, R.; Banerjee, P.S.; Bhatt, S.; Chaubey, R. 2009. *Changing dynamic of agrarian tenancy in India: A rapid appraisal in 45 villages across 14 states*. Anand, India: IWMI-Tata Water Policy Program. Draft report.
- Singh, D. 2007. Who gains and who loses in the game of groundwater markets in water-scarce regions. *Agricultural Economics Research Review* 20: 354-360.
- Sugden, F. 2013. Pre-capitalist reproduction on the Nepal Terai: Semi-feudal agriculture in an era of globalisation. *Journal of Contemporary Asia* 43: 519-545.
- Sugden, F.; Gurung, G. 2012. *Absentee landlordism and agrarian stagnation in Nepal: A case from the Eastern Terai*. Kathmandu, Nepal: Nepal Institute of Development Studies (NIDS). 106p.
- Sugden, F.; Maskey, N.; Clement, F.; Ramesh, V.; Philip, A.; Rai, A. 2014. Agrarian stress and climate change in the Eastern Gangetic Plains: Gendered vulnerability in a stratified social formation. *Global Environmental Change* 29: 258-269.
- Wilson, K. 2002. Small cultivators in Bihar and 'new' technology: Choice or Compulsion. *Economic and Political Weekly* 37(13): 1229-1238.

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