

Exclusions in the Cambodian irrigation sector: perspectives from Battambang province

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Abstract – This article offers a case study in Battambang province that examines agrarian and land dynamics in an irrigated command area. Building on the “powers of exclusion” framework developed by Hall, Hirsch and Li, we show how irrigation reshapes socio-spatial configurations locally and reinforces the dynamics of social differentiation between smallholder farmers. We argue that the uneven geography of water and the transformation of land ownership structures to which the irrigation project in question contributes run in the opposite direction of a pathway that would support the development of inclusive pro-smallholder irrigation.

Keywords: irrigation / land markets / exclusion / social differentiation / Cambodia

Résumé – **Dynamiques d'exclusion dans le secteur de l'irrigation au Cambodge : perspectives de la province de Battambang.** Cet article présente une étude de cas qui examine les dynamiques agraires et foncières dans un périmètre irrigué de la province de Battambang. Se basant sur le cadre d'analyse des « *powers of exclusion* » développé par Hall, Hirsch and Li, nous montrons comment l'irrigation transforme localement les configurations socio-spatiales et renforce les dynamiques de différenciation sociale au sein de la paysannerie. Nous soutenons que la distribution inégale de l'eau et la transformation de la structure de propriété foncière auxquelles le projet d'irrigation contribue vont à contre-courant d'une voie de développement de l'irrigation durable et inclusive de la petite paysannerie.

Mots clés : irrigation / marchés fonciers / exclusion / différenciation sociale / Cambodge

1 Introduction

The development of irrigation takes centre stage in the agrarian modernization project of the Royal Government of Cambodia. It is pivotal in poverty reduction strategy and in the rice production and export ambitions of the country (RGC, 2010, 2019). Many private stakeholders and development partners have rallied to the cause of the government in transforming the rice sector towards an export-oriented business venture. The outcomes are spectacular. Between 2013 and 2017, total paddy production has increased by 12% (from 9.39 Mt to 10.5 Mt). During the same period, exports moved from 0.38 Mt to 0.64 Mt, an increase of 68% (MAFF, 2018).

Irrigation has made an important contribution to these transformations. Since the early 1990s, the considerable investment made to rehabilitate and expand irrigation systems has resulted in a steady increase in irrigation infrastructures. According to the 2013 agricultural census, irrigated area with cereals and grains accounted for 22% of the total area under annual crops (NIS, 2015). Despite ongoing efforts, a significant number of systems remain un- or partly-functional so there is much prospect for further development (Venot and Fontenelle, 2016).

The dialogue between policy-makers and practitioners involved in irrigation development revolves mainly around technical engineering, water management and agricultural development. Land issues are often absent from the discussion. This is surprising as land rights and land reforms evolve in tandem with agrarian transformations (Diepart and Middleton, 2022). A tension lies at the heart of these relations.

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Agricultural intensification, and its benefits in terms of food supply and family income come with a legitimate demand from farmers for more secure land rights. Concurrently, irrigation generally brings about land use specialisation and a shift towards more commercial farming. This often strengthens economic vulnerability (de Silva *et al.*, 2014), particularly observed in large irrigation projects (Johnston *et al.*, 2013; Thuon, 2013).

This article contributes to this conversation. It examines land tenure dynamics embedded in agrarian dynamics occurring in one irrigation system in the north-west region of Cambodia. The case illustrates market-assisted land accumulation within farmer communities, a process found in many other regions of the country (Diepart and Middleton, 2022). We examine how it reinforces or reshapes the socio-economic differentiation between smallholder farmers.

In the next section, we lay down the conceptual framing of the study based on notions of access and exclusion. We then present the study site and our fieldwork methods. Further, we elicit the land tenure/water nexus at command area and farming systems levels. In the final section, we discuss the study implications for a development of irrigation that is inclusive and sustainable for smallholder farmers.

2 Framing irrigated land tenure as exclusion's double-edge

Rooted in the tradition of political ecology studies, our approach rests on the notion of exclusion as developed by Hall *et al.* (2011). Following these authors, we do not envisage exclusion normatively as a good or a bad thing but rather as an inevitable feature in land relations. We consider that land use and access require exclusion of some kind. Even smallholder farmers need to be able to exclude others to enjoy tenure security, cultivate their land effectively and to be able to invest in it. Seen this way, exclusion is a double-edged process. While exclusion is necessary for some people to create and maintain access to resources, it also places limitations that prevent other people from benefiting from them (Hall *et al.*, 2011).

Hall *et al.* (2011) suggest that exclusion is structured by the interaction between four different types of powers: regulation, force, market and legitimation. Each of these powers works to maintain, prevent or deprive access to resources either by setting rules (regulation), by violence or intimidation (force), by creating prices and giving primacy to exchange over use values (market), or by establishing a moral basis for exclusive claims (legitimation). Even if exclusion is somewhat inevitable, the combined use of these powers can have damaging effects on the lives of those who are excluded. Yet, Hall *et al.* (2011) suggest these four powers are variably effective across different scales and that some powers of exclusion are not systematically pervasive in every situation.

We examine exclusions as “power in process” by questioning how power is used, by whom and what outcomes it forges. The context of irrigated agriculture leads us to identify different power dynamics according to the materiality of the resources: fluid in the case of water and fixed for land. The control over water flows for instance requires a timely and relatively quick intervention, while the control of land appeals to longer processes that can accumulate over time.

Little is known about the connections between water, land tenure and agrarian change at the level of irrigation schemes. To fill this gap, we examine how the control of irrigation water interacts with different forms and intensities of exclusion from land and agricultural development.

We address exclusion's double-edge in the water-land tenure nexus at two levels. At the command-area level, we examine how power strategies at work in the water sector transform the agricultural systems. We then examine how the emerging geography of agricultural development in the command area reshapes patterns of market-driven differentiation between farming households.

2.1 Socio-spatial reconfigurations at the command area level

In Cambodia, a large majority of irrigation schemes are not fully functional due to incomplete rehabilitation efforts and persisting management difficulties (Nang *et al.*, 2011). As a result, the availability and access to water often differ within a command area. This leads to a spatial differentiation as areas have unequal potential for agricultural intensification. We hypothesize that this spatial differentiation induces different social dynamics of production that involve the farmers and a wider economic network, in which agricultural production is embedded.

This socio-spatial reconfiguration has two articulated dimensions. First, beyond engineering work that sets the physical possibilities of water distribution, the institutions devised to manage water have a prominent role in determining access. In Cambodia, actor networks mobilized around water are heavily structured and influenced by patronage rules and the authority lines of the State (Deligne, 2014). Guided by Cambodian authoritarian governance, the use of political intimidation to force a decision and foment exclusion can even be described as a common practice in the sector (Blake, 2021; Marston and Hœur, 2015). This largely plays out in terms of decisions regarding construction or rehabilitation of irrigation infrastructure and the form taken by irrigation institutions, but it has also a bearing on the daily decisions that Water Users Associations (locally known as farmer water user communities – FWUCs) can effectively make and on the control these groups have over the resources (Ivars and Venot, 2019; Mak, 2017). The second dimension relates to the commodification processes through which agricultural outputs are produced for and inputs obtained from market exchanges (Bernstein, 2010). In Cambodia, resources commodification heightens the influence of market volatility (Kong *et al.*, 2021) and leads to increased risks of losing economic assets including land (Diepart and Middleton, 2022). The vulnerability resulting from these factors incentivizes both a demand for individual, exclusive and secure land rights but also the collateralization of land allowing the uptake of credit. The commodification and financialization of land are pivotal in the mechanisms of land access, exclusion and dispossession (Green, 2020; Green and Bylander, 2021). In an irrigation system, they are tightly linked to water availability, so that the uneven distribution of water influences how the commodification and financialization of land play out across the command area.

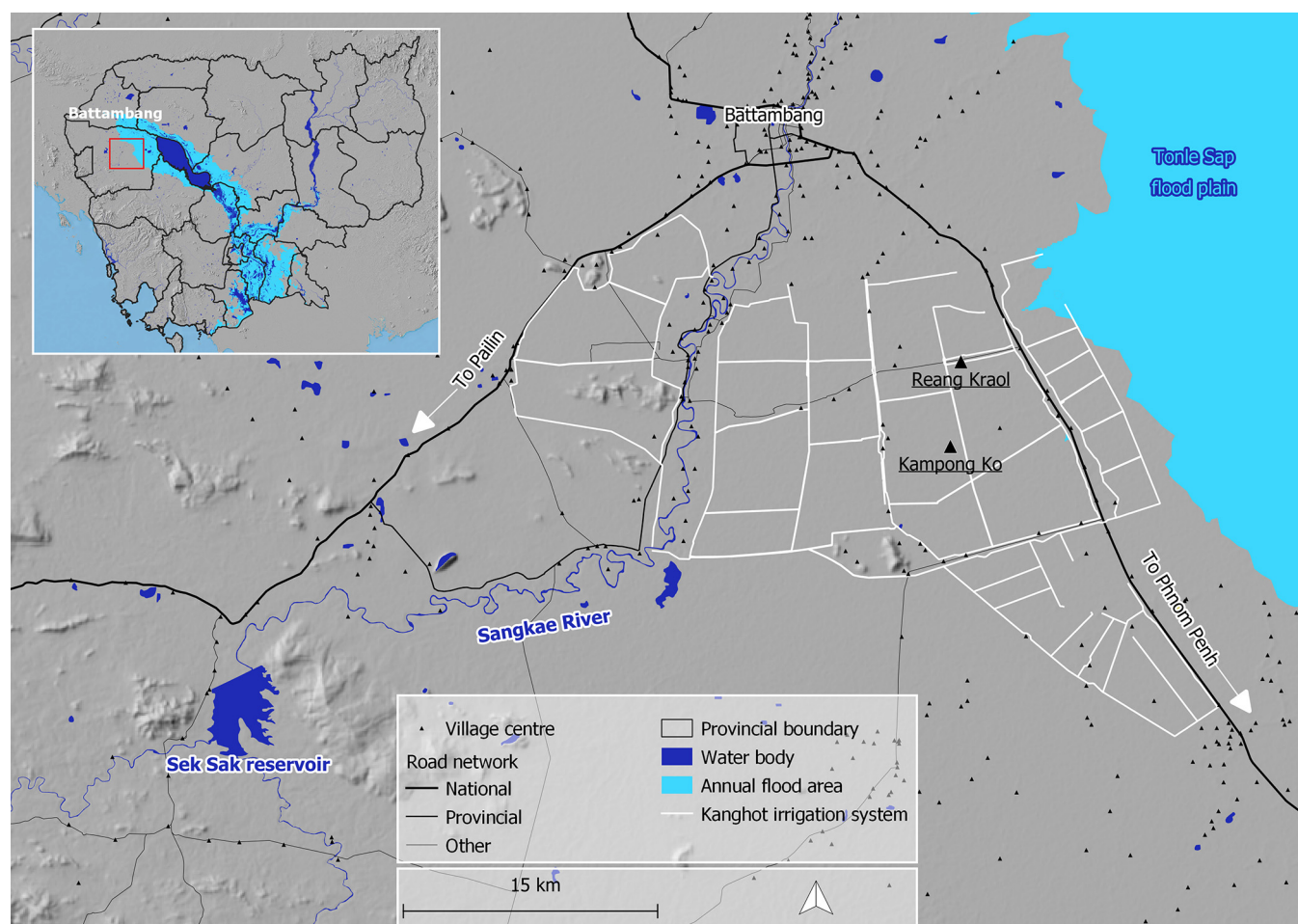


Fig. 1. Situation map of the study area. Source: [Schiele et al., 2020](#) and authors. Mapping: authors.

Fig. 1. Localisation de la zone d'étude. Source : [Schiele et al., 2020](#) et auteurs. Cartographie : auteurs.

2.2 Differentiation in land access at the level of smallholder farmers

Yet all smallholder farmers are not equally equipped to navigate the transformations at play in these new irrigated landscapes. Assets and income distributions are usually skewed, and the capacity of farmers to adopt innovation, and embrace irrigation-driven agricultural intensification, can differ considerably. Likewise, their ability to manage risks and economic vulnerability varies greatly within villages. The socio-spatial reconfigurations described above create the conditions to modify the reproduction strategies of smallholder farmers towards more rapid socio-economic differentiation within farming communities, a process [Hall et al. \(2011\)](#) refer to as “intimate exclusion” to highlight the fact that they are at play from below between social peers.

Following the classical agrarian question of the emergence of agrarian capitalism, a key dynamic process is the polarization of capital and labour. This is a critical process in agrarian capitalism as it tends to lead to a divorce between smallholder farmers and their land ([Akram-Lodhi and Kay, 2009](#)). Yet other authors have argued that a key characteristic of ongoing agrarian transformations in Cambodia and Southeast Asia is the persistence of smallholder farming

and the diversification of their livelihoods through a multiplicity of labour practices, including increasing agricultural wage labour and work outside of agriculture ([Diepart et al., 2006](#); [Rigg et al., 2016](#)).

3 Field study sites and research methods

This article builds on fieldwork conducted at the Kanhhot irrigation system situated in Battambang province (north-west Cambodia), about 15 km south of Battambang city (see [Fig. 1](#)). The storage reservoir for the Kanhhot irrigation scheme is located at Sek Sak on the Sangkae River, a tributary of the Tonle Sap Great Lake ([Fig. 1](#)).

The Kanhhot irrigation system is made of water diversion from rivers or reservoirs with a nested hierarchy of canals allowing for gravity-fed irrigation and pumping, and is typically used for two rice harvests.

We conducted qualitative field research in two villages – Kampong Ko and Reang Kraol – ([Fig. 1](#)) over two weeks in August 2021. We could move around freely despite the Covid-19 pandemic restrictions, but we purposely limited group discussions to a maximum of five people. In total, we consulted 36 people.

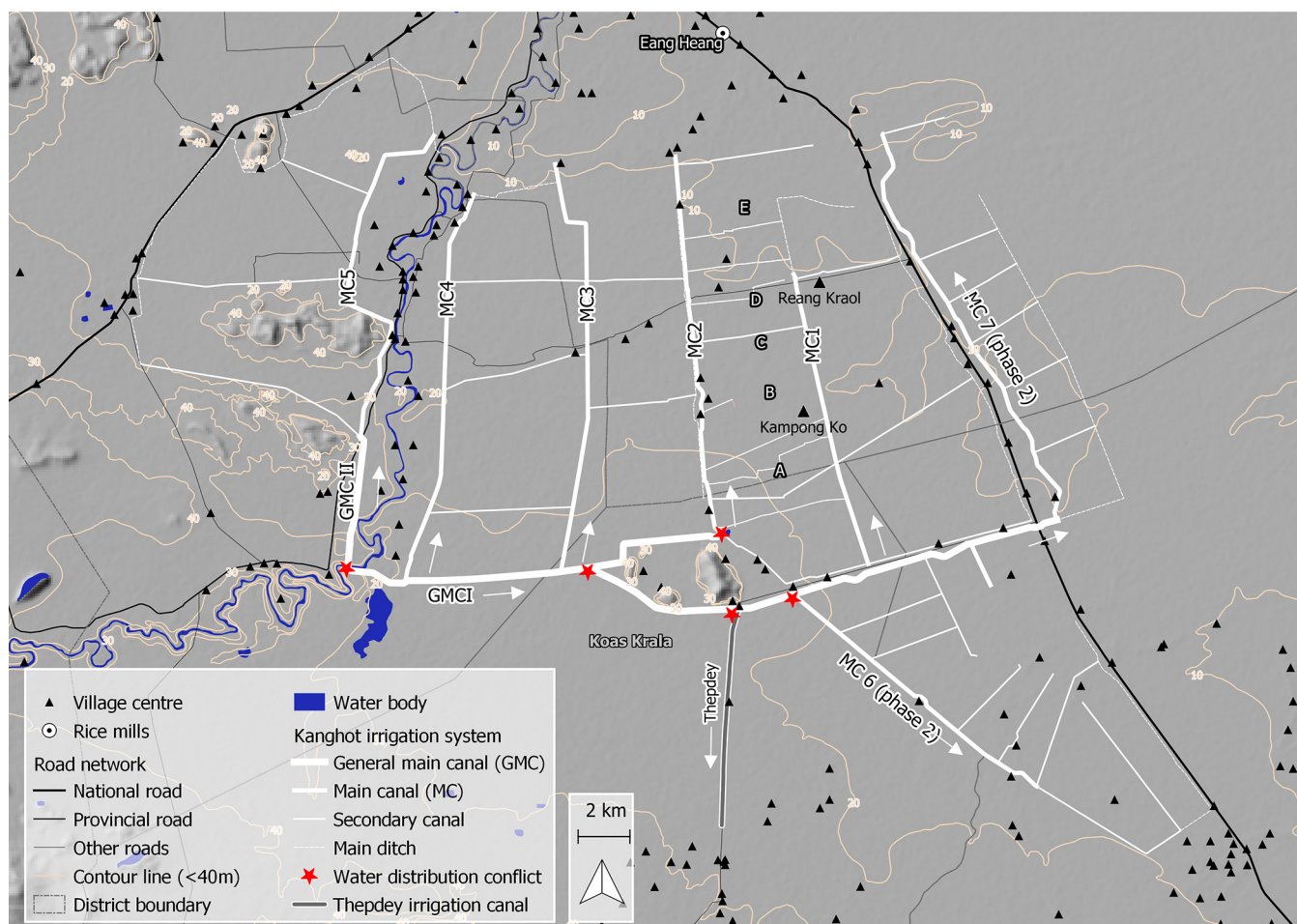


Fig. 2. Structure of the Kanghot irrigation system. Source [Schiele et al., 2020](#) and authors. Mapping: authors.

Fig. 2. Structure du système d'irrigation de Kanghot. Source : [Schiele et al., 2020](#) et auteurs. Cartographie : auteurs.

To capture the socio-spatial reconfiguration at work in the command area, we conducted a field reconnaissance to assess the heterogeneity of irrigation practices within the command area and enhance the mapping of the irrigation system and precisely locate the main water conflicts areas. Both villages were selected on the basis of this reconnaissance; they represent contrasting situations in terms of irrigation intensity. Kampong Ko is located within the core of the command area (high availability of water) while Reang Kraol is located more peripherally and has less available water. We conducted different interviews with representatives from the provincial administration and from the ministry in charge of water resources and meteorology at the provincial level. At the village level, we conducted several key informant interviews with representatives from local authorities, and from the FWUCs to understand and contextualize land and agrarian issues in the system. To facilitate all discussions, we used a series of maps that helped to render the information spatially explicit.

To examine patterns of socio-economic differentiation, we organized focus group discussions in each village and different follow-up interviews to gather farmers' perspectives on these issues. During these village discussions, we reviewed the agrarian history and changes in the area over the last 40 years.

We then examined household trajectories against the same timeline and established a typology of current farming systems ([Fig. 3](#)). These findings were validated by workshop participants and further discussed with two researchers involved in the same study sites.

4 Kanghot: a large-scale irrigation system in the rice plain

4.1 Unequal distribution of water across the command area

Kanghot irrigation system was constructed in 1976 under the Pol Pot regime, abandoned during the civil war, and then rehabilitated in two phases (2009–2013 and 2014–2015). The total command area of the phase 1 system covers 47 000 ha. [Figure 2](#) shows that it consists of two general main canals (GMCs) and five main canals (MCs). Under phase 2, two additional hydraulic units covering more than 17 500 ha were added to the southern and eastern ends of the scheme. It consists of two main canals ([Fig. 2](#)).

Both rehabilitation phases and the construction of the multipurpose dam at Sek Sak (irrigation and hydropower) were funded through a concessional loan from the Eximbank of

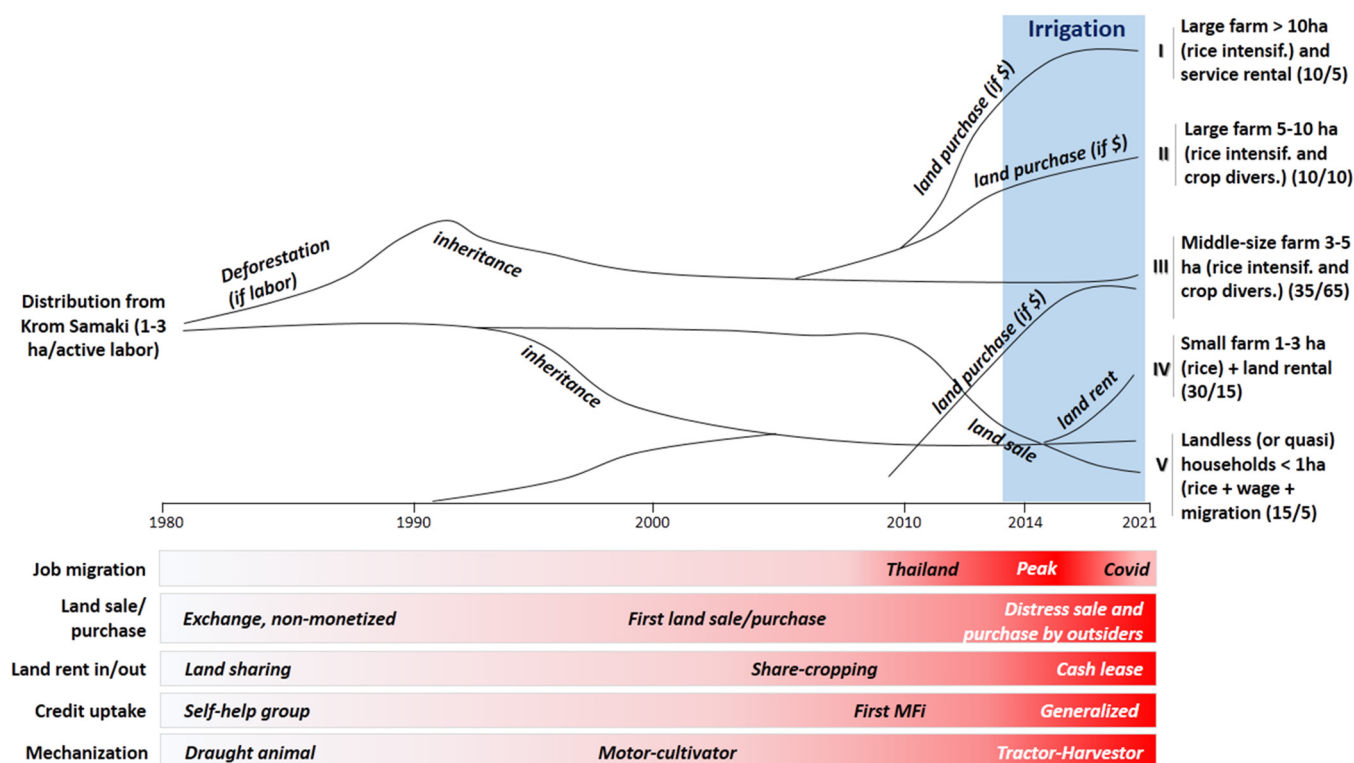


Fig. 3. Trajectories and typology of activity systems in Kampong Ko and Reang Kraol. Source: authors. Key: The colour intensity gives a qualitative appreciation of the intensity of the process (dark red representing the highest intensity). The number in brackets indicates the percentage of households of each type in Kampong Ko (left) and Reang Kraol (right).

Fig. 3. Trajectoires et typologie des systèmes d'activités à Kampong Ko et Reang Kraol. Source : auteurs. Clé de lecture : L'intensité de couleur donne une indication qualitative de l'intensité du processus en jeu (rouge foncé indique la plus grande intensité). Les nombres entre parenthèses donnent le pourcentage du type de système pour chaque village, Kampong Ko (gauche) et Reang Kraol (droite).

China, and the construction contract was awarded to a Chinese company (Grimsditch, 2017). The management and operation of the headwork of the Kanghot scheme is now under the control of the Provincial Department of Water Resources and Meteorology (PDWRAM) (Schiele *et al.*, 2020). Water management and the maintenance of each MC is the responsibility of the FWUCs, which are local community-based organizations whose role also include the collection of water service fees. The provincial department of MoWRAM ensures the coordination of the five FWUCs.

Water is unequally distributed across the command area. MCs 5, 4 and 3 cannot be used without considerable pumping (Schiele *et al.*, 2020), and investment in the building of secondary and tertiary canals is limited as a result. Only the command area supplied by MC2 and MC1 can be irrigated by gravity. As such, it has become the core area of the irrigation system. Multiple donor interventions are enabling the construction of secondary and tertiary canals, as well as agricultural research and development services and support for FWUCs to achieve effective water management. This core area has been divided into blocks A-B-C-D-E (Fig. 2) for management purposes. There is a gradient of water availability from south to north, blocks A-B being better supplied than the other three. According to our respondents, land prices have singularly jumped from USD 2 to 3000/ha in 2010 to USD

10 000/ha in 2021 in Reang Kraol and up to USD 15 000/ha in Kampong Ko. In this context, market forces have clearly become a factor of exclusion as land access through market transactions is more competitive and put better-off farmers at an advantage.

One or two MCs are managed by a FWUC but the coordination between FWUCs at provincial level by the technical department in charge of water was considered not very effective by our local-level respondents. Water management is further challenged by the exercise of power and the use of force by influential and well-connected individuals engaged in agricultural businesses within and beyond the command area. The area south of GMC I falls mainly within Koas Krala district (Fig. 2) – an area where post-war land management has given rise to conflict due to massive land grabbing perpetrated by people in the military (Schneider, 2011) who later transferred land to a business tycoon who claimed 5144 hectares in three communes of the district (Sun, 2020). In this context of violence and significant inequality in land access the use of force and intimidation in water allocation is barely surprising. These tensions were clearly palpable during our discussions, as exemplified by one of our respondents:

In the beginning, access to water was anarchic, the first come was the first served. Water distribution conflicts occurred in many places [he shows the locations on the map]. Now, it is

slightly better since they have established the FWUC, but the risks are still there. In 2018, things got very hot when a well-connected agricultural entrepreneur tried to break the MC2 to divert water to his fields outside of the command area.

Figure 2 shows the locations where tensions and sometimes violent conflicts have erupted between farmers groups or with well-connected agricultural entrepreneurs who were trying to divert water away from Kanghot towards its southern tail end, for instance along the Thepdey canal constructed in 2007.

Well-connected landowners who own land in the Tonle Sap floodplain have attempted to divert water from Kanghot to the east too. The testimony of one respondent gives an example of how inequality in water distribution materialises:

Last year, water distribution was unfair. MC1 to MC4 (four main canals) received water only during six days while MC6-MC7 received water for seven days. It was to the advantage of a [well-connected person] who owns large rice landholdings along the national road. This is unfair because there are far fewer secondary canals in this area and the water benefits far fewer farmers.

In their counter-narrative, provincial authorities dismiss the institutional problems and justify the insufficient and unreliable water supply by external factors, as indicated by one respondent:

The more water and opportunities they get, the more people complain.... In fact, the reason why some people do not have reliable access to water is partly due to technical problems in the construction of some MCs. But the main factor is climate change, which causes a delay in the start of the rainy season. So when the first rains arrive, all the farmers start their cropping at the same time and, as a result, there is not enough water in the canal to meet peak demand.

Apolitical arguments are made here to disregard conflicting claims and power imbalances, thus providing a justification that legitimizes exclusion.

4.2 Household trajectories and social differentiation between farming systems

Irrigation water in Kanghot is primarily used for early wet season rice production and as a supplement to rain-fed rice. Dry season irrigation is limited to early dry season non-rice crops. Within a few years, nearly all farmers from both villages have replaced their traditional rice varieties by shifting to export-destined jasmine rice varieties, thus fully embracing the rice export policy. Both villages in this study have gone through similar patterns of change but are located in the MC1-2 command area at different locations along the water gradient.

Based on village focus group discussions, Figure 3 depicts some elements of the recent agrarian history of the villages from 1980 to the present. The effect of the intensification of rice production and commercialization since 2010 stands out clearly. Processes of mechanization, land market transactions, reliance on micro-credit and job migrations were all initiated in the early 2000s but have accelerated considerably from 2010. Increasing demand for rice commercialization incentivized the commodification of land-labour relations. The uptake of micro-credit (from a micro-finance institute or agricultural

middlemen) has increased to cover the costs of agricultural inputs. By choice or constraint, job migration is on the rise and the unfolding labour shortages have incentivized mechanization.

These mutually reinforcing processes are part of a single logic of production in motion since 2010. However, it accelerated in 2014 when irrigation became operational across the command area and supported the intensification of rice production. The head of a household who belongs to type II (Fig. 3) expressed this logic in her own words: *“Overall, irrigation has improved the livelihoods of landed-households, particularly those with large landholdings. But we have all become highly indebted. So a lot of the benefits we gain are used to pay back to the micro-finance institutes.”*

Figure 3 charts the trajectories of individual households against this backdrop. During the land distribution from Krom Samaki (a collective production unit consisting of 10–15 households put in place in the early 1980s, but short-lived), land was allocated to households based on their active labour. Likewise, their labour capacity allowed families to clear forested land and expand their agricultural landholding, though it was only for rain-fed rice production. Until the end of the 1990s, the differentiation in land access between families was based mainly on the labour capacity of the households. By 2010, economic circumstances had changed due to the increased commercialization of rice and the commoditization of all aspects of production. The generalized uptake of credit for productive and non-productive purposes added another layer of risks and vulnerability to smallholder farmers. And the combination of climate hazards, bad harvests for several consecutive seasons, and/or the unproductive use of credit, put vulnerable smallholder farmers in a situation of re-payment default: if they did not have an alternative source of income, the family tended to tackle the crisis by selling part or all of their agricultural land. To compensate for this loss, they turned to job migration as local wage labour opportunities declined due to generalized mechanization.

The introduction of irrigation has reinforced this mechanism as systematic double-cropping implies higher debts and more risks for farmers. This finding echoes Green's observation (2021) suggesting that irrigation conditions have placed Battambang's rice farmers in a precarious position. Indebtedness, combined with climate hazards and an unreliable supply of water, has exacerbated the risks and economic mobility *via* land purchase-sale. This is the main mechanism underlying the current social differentiation processes in Kanghot and the reason why the ability of farmers to benefit from irrigation is so unequally distributed (Fig. 3).

This mechanism is at play across the command area. But in Kampong Ko, where double cropping is generalized, the differences between farming systems are more pronounced than they are in Reang Kraol, as shown by a more stretched distribution of households (Fig. 3). This finding validates the fact that current practices of irrigation act as a catalyst for social differentiation.

This mechanism of intimate exclusion, *i.e.*, land accumulation/loss, is at work within villages but also well beyond. One type of land transfer that has become widespread in the main command area relates to transactions between outside landowners based in Battambang city who buy the land from an indebted farmer but rent it back to him. These transactions are

driven by a couple of land-brokers active in the village who work for Battambang-based rice mill entrepreneurs or jewellery-shop owners (Fig. 2). They are usually Sino-Khmer families who have been investing their capital to accumulate land-based wealth. The main advantage of this type of transaction for the farmers, compared with selling the land to a fellow villager who wants to expand his agricultural landholding, is that he/she remains a tenant of the land and keeps an income-generating activity in the village. Outside landowners are perfectly aware of this and use this leverage to negotiate the price of land with the seller.

This mode of land accumulation pre-existed the development of irrigation but has accelerated considerably since 2014. It is highly significant in scope, as one of our respondents who holds responsibility in a local water management group told us: *“A lot of families who could not pay their debt to the micro-credit institute had to sell some or all of their land to these rich people from the city. They rent the land to continue growing rice there but they don’t own it anymore. In the MC1-2 command area, about 40 percent of the households are in this situation, relatively more inside block A-B than in blocks CDE.”*

5 Inclusive irrigation for smallholder farmers?

At an aggregate level, the development of irrigation has improved agricultural production and productivity as well as the livelihoods and income of some farmers. However, our findings suggest that these benefits are unequally distributed, both spatially and socially.

First of all, the physical infrastructure is not uniformly operational across the command area, which contribute to shaping an uneven geography of water. Also, the insertion of irrigation in the agricultural landscapes has introduced new forms of exclusion or catalysed existing ones. The powers of force, market and legitimation are at work, often in conjunction with each other, to form socio-spatial configurations that shape and limit access to water and the ability to engage in agricultural intensification.

We have not highlighted the power of regulation to be dominant in the case study. It is mainly because the rules for irrigation management and the capacity to enforce them, at both provincial and local levels, are at an infant stage. This finding echoes an argument made by Ivars and Venot (2019) based on studies they conducted elsewhere in Cambodia.

In Kanghot, water supply varies considerably across the command area. The exercise of force and intimidation is common practice to divert water within or outside of the scheme. Also, the role of public institutions and their wider networks with cronies means that the unbalanced geography of water management that emerges is legitimized.

A cornerstone of the agrarian modernization policy, irrigation reinforces the commoditization of all aspects of production and the commercialization of its outputs. All risks and costs are borne by smallholder farmers, particularly the burden of debt and the obligation to reimburse loans. The rapid social differentiation between smallholder farmers sees the

emergence of capitalist relations of production, typified in the capital-labour polarization. Yet labour not only serves capital accumulation processes through local wages but has also become increasingly mobile, migration-related, and disconnected from agriculture. The change in the social relations of production occurs through a transformation of the land ownership structure. Beyond land accumulation built-in within a village between fellow farmers, we observed the emergence of a neo-feudal agrarian structure wherein farmers who lose land become tenants of a new class of urban landlords, running in a direction that is opposite to an inclusive pathway supporting pro-smallholder irrigation.

The underlying forces that generate these outcomes were already in motion before irrigation water started to flow. Rather than creating them, irrigation has reinforced all of these exclusionary processes, which supports the need for a better understanding of agrarian and resources tenure dynamics in the design phase of irrigation projects, and the closer monitoring of farming systems once the system is in use.

6 Conclusion

This article offers a preliminary exploration of land tenure issues in agrarian landscapes reshaped by irrigation. Based on the case study of the Kanghot irrigation scheme in Battambang province, we have argued that the practices of irrigation in this area reinforces exclusionary processes that shape socio-spatial configurations of local waterscape and the dynamics of social differentiation between farming systems. Yet irrigation does not give rise to these outcomes in a vacuum but rather strengthen pre-existing processes of land and labour commodification.

By situating irrigation development in a wider agrarian change perspective, the case study shows that the increase in farmers’ vulnerability to market-related risks outweighs the contribution of irrigation in reducing their vulnerability to irregular water access.

This preliminary exploration will be expanded to different socio-ecological systems to identify trends and patterns across the country. In the pursuit of an inclusive pathway for pro-smallholder farmers’ irrigation, this body of evidence will eventually serve to inform policy-making processes about the integration of land tenure issues, from the design to the monitoring of irrigation projects.

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