



IRRIGATED LAND TENURE IN MYANMAR AND CAMBODIA: THE STATE, THE MARKET... AND SMALLHOLDERS!

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1. CONTEXT AND OBJECTIVES	3
2. IRRIGATED LAND IN MYANMAR AND CAMBODIA	4
3. METHODOLOGY	4
4. RESULTS	5
4.1 Historical perspective relating to irrigation and rice production: the omnipresent State	5
4.2 Irrigated land tenure. What institutions are we talking about?	6
4.3 Key issues in irrigated land tenure	8
5. RECOMMENDATIONS FOR A BETTER INCLUSION OF LAND TENURE ISSUES IN IRRIGATION INVESTMENT	10
6. KEY MESSAGES	10
LIST OF REFERENCES	11

LIST OF ACRONYMS

AFD	Agence Française de Développement (French Development Agency)
COSTEA	Comité Scientifique et Technique Eau Agricole (Scientific and Technical Committee on Agricultural Water)
EIA	Environmental Impacts Assessment
FWUC	Farmer Water User Communities (Cambodia)
HYV	High Yielding seed Varieties
LUC	Land Use Certificate (Myanmar)
MADB	Myanmar Agricultural Development Bank
MoE	Ministry of Environment (Cambodia)
MONREC	Ministry of Natural Resources and Environmental Conservation (Myanmar)
WUA	Water User Association (Myanmar)

1. CONTEXT AND OBJECTIVES

Rehabilitation and expansion of irrigation takes centre stage in the agricultural development policies of Myanmar and Cambodia. They imply multi-dimensional transformations (ecological, infrastructural, and socio-political) that reshape agricultural landscapes. Investment in irrigation usually takes place in areas occupied and used, individually or collectively, by local communities in multiple ways and according to hybrid land tenure arrangements that usually borrow from State rules and customary practices. Understanding how irrigation investments change the social relations between actors relating to land and connected resources is, therefore, central to sustainable irrigation development.

As part of its knowledge management strategy, the Scientific and Technical Committee on Agricultural Water (COSTEA) of the French cooperation has identified irrigated land tenure as an important field of research. It commissioned a study on this topic in Cambodia and Myanmar - countries where the French

Development Agency (AFD) has been active in supporting the development of the irrigation sector [1], [2]. The core objective of the study was to better understand the land tenure issues unfolding in irrigation development and to propose an analytical framework that could inform the design of AFD-supported irrigation projects.

This brief offers a synthesis of this study. It first presents the general context and our methods. In the results section, a historical approach first serves to highlight how irrigation development has been central in State formation processes throughout the agrarian history of both countries. The next section presents the assemblage of actors and institutions that are central to contemporary irrigated land tenure governance. Against this backdrop, three key themes or issues to be accounted for in governing irrigated land tenure are explored: the securitization of rights; agrarian changes that involve social differentiation and indebtedness; and the reconfiguration of access and use of resources in multi-functional wetlands progressively converted to irrigation. The last section discusses the study implications for more effective inclusion of land tenure issues in the design and implementation of irrigation projects.

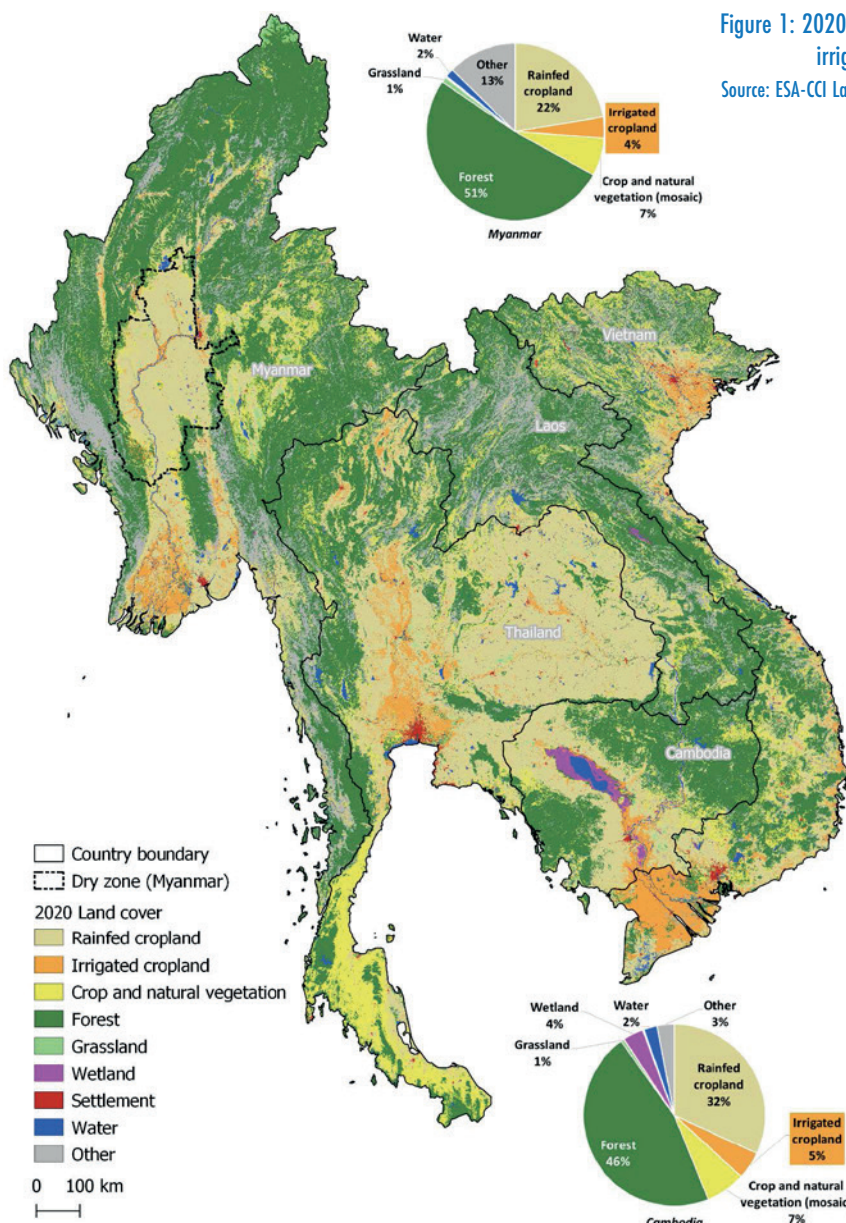


Figure 1: 2020 Land Cover in the Mekong region and share of irrigated cropland area in Myanmar and Cambodia
Source: ESA-CCI Land cover - Data computation and mapping by the authors

2. IRRIGATED LAND IN MYANMAR AND CAMBODIA

The geographic divide between the agricultural lowland and peripheral upland forest regions is a determining feature that organizes the national territory in Myanmar and Cambodia. Lowland regions are predominantly cultivated for rice production, whereas the uplands comprise non-rice crops and forests, sometimes an undifferentiated mosaic of both (Figure 1). As shown in Figure 1, the irrigated cropland areas are mainly concentrated in lowland rice producing regions, suggesting, from the start, that rice cultivation and irrigation development processes work in tandem.

In Myanmar, the total irrigated cropland area (approximately 2.5 Million ha) is mainly located in the Irrawaddy Delta and the so-called Dry Zone located to the north of it. In Cambodia, the irrigated cropland area (0.9 Million ha) edges the seasonally flooded plain surrounding the Tonle Sap Great Lake, spanning the Upper Mekong Delta towards Vietnam (Figure 1). In both geographies, irrigation systems are found in agro-ecological environments that either are, or are not, seasonally flooded. Irrigation systems can take the form of embankments or polders to control flood, water diversions from rivers or reservoirs with a nested hierarchy of canals, pumping systems, drainage canals, groundwater wells, or partial water control infrastructure for recession agriculture.

Despite the obvious differences in the agricultural landscape of both countries, the irrigated cropland area represents 4 and 5% of the total land area of Myanmar and Cambodia, respectively, and 11% of the total agricultural area of both countries. So irrigation is definitively on the map of Myanmar and Cambodia, although the bulk of their cropland remains rainfed.

3. METHODOLOGY

Irrigated land tenure realities are highly diverse - ecologically and socially - in both countries. So the first key challenge was to organize data and information to capture the complexity of actors and processes at stake while generalizing findings to address questions relevant to national actors (policymakers, donors, and practitioners alike). From the outset, the objective was to develop a research methodology that articulated macro-level processes (land tenure regime, legal and institutional framework) with detailed analyses of local irrigation dynamics. And to the extent possible, Geographic Information System (GIS) tools were used to situate processes and actors spatially and to understand the relations/interdependences between ecological and socio-political processes.

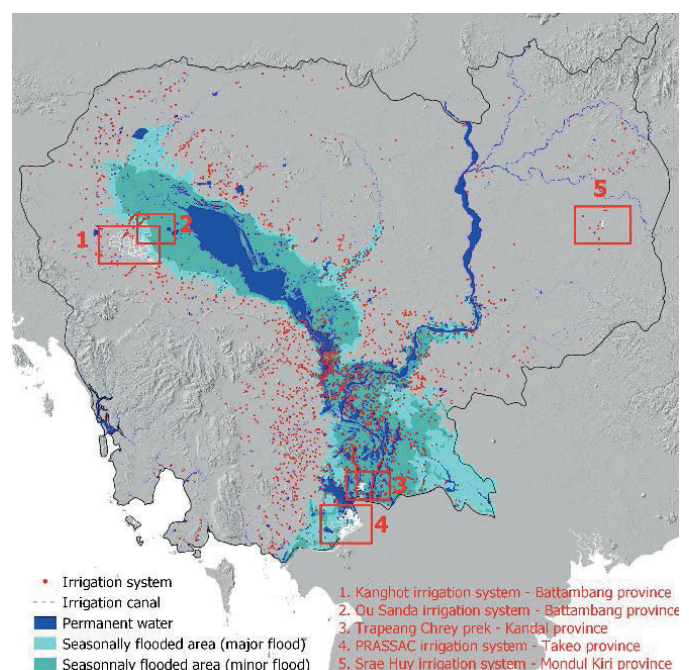
To start with, the study explored land tenure dynamics and how they related to the development of irrigation and broader agrarian change across the countries. This involved an overview of land use dynamics and of the legal and institutional pluralism that characterizes each land tenure regime in relation to agriculture, wetland management, and nature conservation.

Second, a typology of irrigation systems based on agro-ecological variables (river basin boundaries, the incidence and extent of floods), the magnitude of the irrigation systems (size of the command areas, and seasonality of agricultural production), and the dominant modes of water control was developed in order to characterize the diversity of irrigation situations.

In a third step, the two previous analyses were combined to map out land tenure issues that characterized each irrigation situation. This involved identifying the land tenure issues at stake in each situation, the actors involved, and the institutional context (formal and informal) that framed their behaviours and decision-making.

Fourth, a more detailed legal and institutional analysis of irrigated land tenure was conducted based on a desk review and interviews with experts affiliated to ministries, development banks, and donor organizations (six people in each country). Relevant laws, decrees, and policies concerning irrigated land tenure were scrutinized, including the roles and responsibilities of institutions in charge of their implementation.

Up to this point, both country-based teams followed a similar methodology to conduct a comparative study. Unfortunately, the military coup of February 2021 in Myanmar and unfolding political circumstances obliged the team to cancel the fieldwork that was initially envisioned. In Cambodia, additional detailed case studies were conducted to examine how the land issues identified above played out in local contexts. Five irrigation systems representing the social-ecological diversity of irrigation situations identified during the desk review (see the Figure next to this text) were selected and in-depth interviews were conducted with representatives from sectoral ministries at the sub-national level (n=6), local authorities at the commune and village levels (n=5), representatives of FWUCs (Farmer Water User Community groups), and local researchers (n=6). Focus groups discussions with farmers directly involved in irrigation (n=8) completed the field work. Fieldwork was interrupted due to Covid-19 and took place from August 2021 to February 2022. A total of 94 people were consulted.



4. RESULTS

4.1 Historical perspective relating to irrigation and rice production: the omnipresent State

From pre-colonial times to the present day, the development of irrigation to support rice production has been central to the agricultural and economic policies of Myanmar and Cambodia. Efforts by the governments of both countries to control agricultural water have shaped the relationships between the State and its peasantry in ways that have been integral to State formation processes.

Cambodia and Myanmar are countries located on the Southeast Asia mainland where one dominant ethnic group (the Bamar in Myanmar and the Khmer in Cambodia) has historically controlled lowland regions favourable to flooded rice cultivation [3]. In pre-colonial times, the population was organized into 'Agrarian States' consisting of relatively unstable political entities placed under the authority of the King [3]. The balance of power was based on the capacity of the crown administration to levy a tax on rice production and to mobilize manpower for warfare and public work on the one hand and the protection of the land rights of the peasants on the other [4], [5]. The development of rice production was thus central to the exercise of power. In Myanmar, irrigation techniques emerged early (c. 200 BC to 900 AD), and agrarian States intensified their power where water control allowed for surplus rice production [4]. In pre-colonial Cambodia, well-functioning irrigation systems were rare, and partly located in the Mekong Delta floodplain. It is now generally accepted that the impressive reservoir structures around Angkor did not play any role in irrigation but were conceived for domestic water supply and to demonstrate power and religious symbolism [6].

In the agricultural sector, the colonial modernization project in Myanmar and Cambodia aimed to boost rice production for export and to levy a tax on rice production to sustain the colonial administration. Considerable investments in irrigation development were made to support this endeavour, mainly in the first half of the 20th century. In Myanmar, the British administration built up large dikes to control flood water in lowland Burma (as it was then called) and to rehabilitate and enlarge existing irrigation systems in the Dry Zone to expand the cultivation area [4]. Likewise, the French protectorate in Cambodia undertook significant projects to build large-scale irrigated systems, polders in coastal areas, and earthen drainage and siltation canals - locally known as preks - along the Mekong [6]. These efforts were paired with the creation of a cadastral system aiming to secure land rights in areas with high potential for agricultural development. But land titling, associated with land mortgages for credit uptake, resulted in land concentration in the hands of moneylenders. These processes have been documented in Cambodia [7] but were particularly widespread in Lowland Burma where farmers were encouraged by the governments to access credit to boost the expansion of the agricultural land area and rice production for export [4].

When Myanmar and Cambodia became independent (in 1948 and 1953, respectively), both countries engaged in socialist

agrarian reform, and governments maintained heavy control over rice production as a cornerstone of their development policies. Irrigation was also instrumental for socialist States to 'develop' the uplands and to settle ethnic-minority groups living in their periphery [8]. In Myanmar, the government placed rice export under State monopoly and established a system of compulsory paddy sale to State companies at prices below those of the international market [4]. The Cambodian experience was more traumatic. After two decades of minimal efforts in developing irrigation, the Khmer Rouge regime came to power with disproportionate ambitions to boost rice production and export, at the cost of immeasurable efforts in the construction of irrigation infrastructures through forced labour [9]. Their revolutionary project quickly became a totalitarian nightmare that turned the population into quasi-agricultural slaves [10]. By the end of the eighties, the agricultural development policies (rice and water), put in place by both governments, reinforced a disjuncture between the State and the peasantry, which confirmed the subordination of smallholder farmers' well-being to the imperative of national development policies.

When both countries took a neoliberal turn in the early nineties, they opted for Green Revolution-like reforms to reduce poverty, address food security and generate surplus export. Policy incentives were given to increase rice production - the introduction of high-yielding rice varieties, enhanced provision of agro-chemicals to farmers, increased support to agro-business and the development (rehabilitation and extension) of irrigation infrastructures. In many ways, the rationale and outcomes of such policies resonates with experiences from the past. In 1992, the Myanmar government launched the summer paddy program designed to boost and control both rice production and its commercialization. Important investments in irrigation and flood control were made and resulted in a significant increase in cultivated area and production [4]. The early success of the program served politically to establish the legitimacy of the new military power that governed from 1988 to 2011. But the control by the State over the reforms ran deep. The production of dry season rice was compulsory in areas delineated for this purpose by the State, which included heavy-handed interventions in water allocation [4]. Dry season rice was relatively more profitable for better-off farmers able to make the necessary upfront investments in high yield varieties and the agro-chemicals that come along with them. When farmers were not able to meet the government requirement for dry season production, their land was redistributed to other farmers through a process that largely favoured farmers with large landholdings [4]. In the end, the summer paddy program reinforced land inequalities in Myanmar, a country that is characterized by the largest rate of landlessness in Southeast Asia (60% in the Irrawaddy Delta and 40% in the Dry Zone) [11]. Cambodia is a late comer to the Green Revolution with the promotion of double cropping and the widespread use of HYV (high yielding seed varieties) and agro-chemical products dating back to the late 1980s. But this has now been fully embraced. The 2010 rice policy [12] - aimed to boost production and export - has worked in tandem with the efforts of the government, via the Ministry of Water Resources and Meteorology, to rehabilitate irrigation infrastructures inherited from the Khmer Rouge regime. The development of irrigation infrastructures has become a major tool of political control and the expansion of authority, employed by the hierarchical ruling party network, which controls the State

administration across the country. This authoritarianism notably serves the interest of China which has become the main investor in the Cambodian water sector [13].

4.2 Irrigated land tenure. What institutions are we talking about?

Strictly speaking, there is no differentiated regime to govern irrigated land tenure in Myanmar nor in Cambodia. But given the geographic and historical convergence of the irrigation and rice production agendas, irrigated land tenure issues are mainly associated with flooded-rice land dynamics. This parallel is emphasized by the fact that irrigation development in both countries mainly revolves around rehabilitating existing, yet poorly maintained, systems. In Cambodia and Myanmar alike, rehabilitation efforts might incentivize the extension of command areas, but creating new systems ex-nihilo is rare. Irrigated land tenure, therefore, relates to pre-existing social relations nurtured around flooded-rice land management.

Instead of one all-governing law, and similarly to most countries in the world, the institutional corpus relevant to land tenure in irrigation is a mishmash of laws and policies connected with the land, water, fisheries, agriculture, environmental and economic sectors. As each piece of legislation is usually embedded within particular ministries and administrations, questions of coordination to address institutional gaps and overlaps are common concerns.

The discussion was organized around five inter-dependant irrigated land tenure themes that link specific legal frameworks, actors, and practices (see Table 1). The first two themes – land tenure security and land expropriation – concern overarching principles mobilized to recognize, formalize or compensate for the loss of land rights in the context of irrigation. They provide the backdrop to the other themes, which are more specific yet cross-sectoral: environmental trade-off, market-based land concentration, and multi-functional wetlands.

Land tenure security. In Myanmar and Cambodia, most irrigated land falls into categories eligible for titling according to national land legislations: land classified as farmland in Myanmar and land cultivated before 2001 in Cambodia. Overall, the population in lowland areas belongs to the dominant ethnic group (Bamar or Khmer), whose land tenure has long been secured and monitored by the central government apparatus. Land titling is a formalization process that builds on local recognition of land rights by local authorities that is long-enduring and relatively unchallenged. As such, the tenure security of irrigated land is generally not a major concern in either country. Lowland areas are also less threatened by land grabs than is the case in upland regions. In both countries, however, land grabs by tycoons, entrepreneurs, the military and/or induced by State farms, are not unusual.

In Cambodia, problems might occur when irrigation incentivizes the territorial expansion of agriculture inside areas considered to be State land, which is notably the case in wetland areas around the Tonle Sap Lake and in the Upper Mekong Delta. The cadastral administration usually adopts a strong stance in following the 2001 rule (i.e., not issuing titles for land cleared

after 2001) but local authorities are more pragmatic and issue a land certificate (a prerequisite for titling) in a more flexible way. Unless agricultural land extension driven by irrigation goes beyond a clear delineation of State land (such as the boundary of a Protected Area), local compromises are often made to find a solution, particularly when the titling ineligibility concerns land genuinely cultivated. In these grey areas, land titling and land right securitization are usually contingent outcomes of local actors' negotiations. This often raises equity issues as the arbitration is embedded in patronage networks that smallholders have little influence over. Contrarily, farmers from Myanmar whose land becomes eligible for irrigation may purposefully avoid titling their holding under the post-2012 Land Use Certificate (also known as 'form 7') in order to avoid the obligation—which remained in place until 2020—to cultivate paddy where irrigation is (even theoretically rather than practically) available.

In both countries, the cadastral administration does not mobilize specific efforts or procedures to title land before irrigation rehabilitations. Development banks and donor organizations, however, have a more proactive role by establishing a list of land owners, checking the coverage of titled land and advocating authorities to regularize land tenure in their area of intervention. However, these measures generally fail to take into consideration land transactions that are widespread and, for Cambodia, may result in titling outputs not being officially recognized by the cadastral administration.

Land expropriation. When an irrigation project results in expropriation (for the construction of roads or the extension of canals), the question of defining fair and just compensation is central. The legal framework mobilized for expropriation is bound by international law. Under international human rights law, coerced and involuntary resettlement is seen as a deliberate retrogression in the enjoyment of human rights (No one shall be arbitrarily deprived of his property, Article 17 of the 1948 Human Rights Declaration (United Nations, 1948).

In both countries, the expropriation process is governed by similar laws and institutions and faces similar limitation. The laws that set out the process of compensation when the State reclaims land for a 'public purpose' are the 2019 Land Acquisition, Resettlement and Rehabilitation Law in Myanmar and the 2010 Expropriation Law in Cambodia. Both are implemented and supervised by an ad hoc inter-ministerial committee.

In both laws there are gaps relating to how affected people are defined and compensated. Landowners must have 'strong evidence' of ownership (Myanmar) or be the 'rightful owner' of the land (Cambodia), which is subject to widely varying interpretations and results in outright exclusion. Furthermore, the legislation governing expropriation silences critical resources and activities such as grazing, improvements made to the land, common pool resources (fishing grounds), or social infrastructure.

In the absence of standard methodologies and clear implementation guidelines, donors usually use their own process - the Safeguard Policy Statement (Asian Development Bank), and the Operational Policy (World Bank) - and there is no clear harmonization with the national legislation yet. The

government refuses to loan money to accompany expropriation, so the mobilization of compensation budgets is down to donor organizations.

Environmental trade-offs. Environmental Impacts Assessment (EIA) is required for irrigation systems larger than 5,000 ha according to the national legislation of both countries (2015 Environmental Impact Assessment Procedure in Myanmar and 1999 sub-decree on Environmental Impact Assessment in Cambodia). Both procedures are overseen by an administration that belongs to a specific ministry: the Ministry of Natural Resources and Environmental Conservation (MONREC) in Myanmar and the Ministry of Environment (MoE) in Cambodia. The problem in implementing these legal procedures is threefold. First, the limited resources allocated to the civil servant staff in charge of the job. Second, as with any cross-sector mechanisms embedded within one specific ministry, there is a challenge in the implementation of EIA for irrigation projects relating to coordination with other project proponents and ministries responsible for infrastructure, industrial or agricultural development. Third, staff carrying out the EIA are paid by the company that submits the projects: the door for biased results and conflicts of interest is wide open. As a result, donors have developed and use their own environmental assessment framework and bypass the national legislation.

Land market and concentration. The Constitutions of both Myanmar and Cambodia embrace a market economy, in which the ownership and protection of private land property rights are recognized. Along with inheritance, land markets are now core institutions that facilitate land transfers between farmers (the 2012 Farmland Law in Myanmar and the 2001 Land Law in Cambodia). However, given that irrigation leads to an increase in land value, the effect of such a free land market is the concentration of

agricultural land into the hands of well-off farmers at the expense of those who are more vulnerable. In the land legislation of both countries, there is no restriction on land accumulation. Likewise, the cadastral administration of both countries does not monitor land transactions before and after titling, nor do the donors.

Irrigation in multifunctional wetland: the hidden frontiers?

There is currently no integrated approach to wetland management, neither in Myanmar nor Cambodia. This is an issue as irrigation can incentivize the expansion of agriculture in these areas. Claims over land, water and related resources are supported in various legal texts and policies implemented by different ministries and are naturally prone to overlap and contradiction. In Myanmar, water for agriculture is managed by the Irrigation Law 2017, while fisheries resources are managed under the Freshwater Fisheries Law (2011), and aquaculture by the Law Relating to Aquaculture (1998). Water is primarily understood as a resource for rice cultivation, so, in multifunctional wetlands, the interests of agricultural are prioritized over those of fisheries. In Cambodia, water for agriculture is managed under the 2007 Law on Water Resources under the Ministry of Water Resources and Meteorology, while fisheries resources are managed under the 2006 Fisheries Law which falls under the Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries. The multiple, and often competing, uses of flooded land is exemplified by conflicts between rice farmers, who want their fields drained at the end of the rainy season, and fishers who want to retain water on the floodplain for as long as possible to increase production and until a time when fish prices rise. Water regulation decisions – especially regarding the management of sluice gates for draining water out of the fields – are often taken without consultations with a wide range of stakeholders, resulting in conflict among them.

Table 1: Major institutions and challenges in irrigated land tenure governance in Myanmar and Cambodia

	Myanmar	Cambodia
Land tenure security	<ul style="list-style-type: none"> • 2012 Farmland Law (amended 2020) paves the way for the issuance of Land Use Certificates on farmland (also known as 'form 7') • Most irrigated lands are located on land classified as farmland so irrigated land tenure is relatively secured • There are no specific efforts by the cadastral administration to secure land tenure before irrigation rehabilitation efforts begin • Donors have a more proactive role than the government in assessing and ensuring land tenure security 	<ul style="list-style-type: none"> • 2001 Land Law frames the formalization of land rights efforts based on the 2001 rule (i.e., that land cultivated before 2001 is eligible for titling) • Most irrigated lands meet this criterion so irrigated land tenure is relatively secured. Expansion of irrigated agriculture into State land (notably wetland areas) is subject to compromise and land security is usually a contingent outcome of local actors' negotiations • There are no specific efforts by the cadastral administration to secure land tenure before irrigation rehabilitation efforts begin • Donors have a more proactive role than the government in assessing and ensuring land tenure security, but problems relating to coordination with the cadastral administration have been reported
Land expropriation	<ul style="list-style-type: none"> • 2019 Land Acquisition, Resettlement and Rehabilitation Law • Implemented by an inter-ministerial committee • Lack of standard methodology and clear procedures resulting in flaws and exclusion • Donors have developed and use their own guidelines 	<ul style="list-style-type: none"> • 2010 Law on Expropriation • Implemented by an inter-ministerial committee • Lack of a standard methodology and clear procedures results in flaws and exclusion • Donors have developed and use their own guidelines
Environmental trade-off	<ul style="list-style-type: none"> • 2012 Environmental Conservation Law and 2015 Environmental Impact Assessment (EIA) Procedure • Implemented by the Ministry of Natural Resources and Environmental Conservation (MONREC) • EIA required for irrigation schemes (> 5,000 ha) • Limited resources and institutional capacity of the public sector to implement EIA • Donors use their own environmental safeguard and assessment framework 	<ul style="list-style-type: none"> • 1999 Sub-decree on Environmental Impact Assessment (EIA) • Implemented by Ministry of Environment (MoE) • EIA required for irrigation schemes (> 5,000 ha) • Limited resources and institutional capacity of public sector to implement EIA • Donors use their own environmental safeguard and assessment framework.
Land market and concentration	<ul style="list-style-type: none"> • 2012 Farmland Law • No monitoring of land market transactions by the cadastral administration and irrigation project proponents 	<ul style="list-style-type: none"> • 2001 Land Law • No monitoring of land market transactions by the cadastral administration and irrigation project proponents
Multi-functional management of wetlands	<ul style="list-style-type: none"> • 2017 Irrigation Law - 2011 Freshwater Fisheries Law - 1998 Aquaculture Law. • No integrated approach to water resources to manage overlapping claims over land, water, and fishery resources, and related conflicts 	<ul style="list-style-type: none"> • 2007 Law on Water Resources - 2006 Fisheries Law • No integrated approach to water resources to manage overlapping claims over land, water and fishery resources, and related conflicts

4.3 Key issues in irrigated land tenure

4.3.1 Recognition and formalization of land rights in irrigated areas

Land tenure in the two countries slightly differs as Cambodia recognizes full ownership of farmers whose land has been titled, while the Myanmar government remains the ultimate owner of all land, conceding to farmers' land use rights only. In practice, farmers from both countries are allowed to transfer their land (through inheritance, sale, rent or mortgage) and to use it as collateral for contracting loans.

Eligibility to titling, however, relies on drastically different principles between the two countries. In Cambodia, the Land Law allows possession only if occupation had started before the effective date of the Law in 2001 (Articles 30 and 31). This means that land not cultivated as of 2001 is considered, *de facto*, as State land and, as such, is not eligible for titling. Most land located in irrigated systems, however, was cultivated prior to 2001. In Myanmar, the 2012 Farmland Law grants Land Use Certificates (LUCs) to farmers cultivating within defined cadastral units. Land falling outside of these units can potentially be recognized and titled as farmland, although the process is cumbersome and out of reach of most smallholders. Implemented between 2012 and 2014, the distribution of LUCs targeted as a priority to lowland farmers and particularly those cultivating land falling under the 'R' – for 'rice' – category, *i.e.*, land with *de facto* access to irrigation. Therefore, the great majority of farmers cultivating within irrigation schemes in both countries have received - or are eligible to receive - titles over their land. In Cambodia, even if land is not yet titled, it is legally possessed, and farmers generally have a land certificate (a so-called soft title) issued by local authorities.

Several issues and risks were, however, identified when it comes to land tenure security. In Cambodia (*e.g.*, Ou Sanda, Trapeang Chrey, and Prasac irrigation systems), the development of irrigation incentivizes the expansion of agriculture onto State land (often wetlands), officially not eligible for titling. At the local level, it is common practice for village or commune authorities to issue land certificates (soft titles) on State land in contradiction to the institutions of the 2001 Land Law. This creates tensions with the cadastral administration (*e.g.*, Ou Sanda) and when the systematic land titling proceeds, not all farmers are equal under the legal framework. Smallholders will more likely be left without a title and at risk of being dispossessed, while well-off farmers or land investors (*e.g.*, in Trapeang Chrey) with appropriate connections might be able to acquire a title for their land even if it belongs to the State domain. Corruption and rent-seeking are common practices and result in exclusionary outcomes for smallholder farmers who are also excluded from titling and face dwindling environmental services as titles are given to others [14]. In Myanmar and Cambodia, the main issue regarding formal land tenure security for farmers in rehabilitated or extended irrigated schemes relates to the accuracy and update of their LUC or possession certificate. Indeed, under land consolidation programmes, or the creation/enlargement of canals, the size or location of some land holdings may change without a proper update on the LUC. This can lead to conflicts between users over land boundaries and impact farmers' capacity to borrow from the largest credit institution, the Myanmar Agricultural Development Bank (MADB), which is determined by the size of the cultivated area.

Finally, in both countries, only the State is entitled to expropriate land for projects of 'public interest', a 'definition' that encompasses the creation or extension of irrigation schemes. Likewise, the provision for compensation 'at market rate' appears in both legal frameworks. Although these two countries are renowned for their capacity to unrightfully acquire land wherever they see fit [14] [15], according to both studies, the expropriation of farmers from their farmland through the development of irrigation schemes did not occur on a large scale. Nonetheless, there may have been indirect expropriations, for instance, through the implementation of State farms along with the development of irrigation infrastructures, as in the case of the Natmauk irrigation perimeter in Myanmar. In Cambodia, while farmers with valid proof of private ownership have been compensated when land has been acquired by the State (*e.g.*, for digging or enlarging canals), problems arise when the expropriation concerns common-pool resources, which are not accounted for in the compensation schemes. Also, a number of water bodies (lakes, rivers, canals, etc.) are deemed State land, which makes any occupation ineligible for compensation, thus leading to the exclusion of some – often poor – farmers (*e.g.*, Kanghot).

Departing from these observations, we shall see in the following point that issues of land tenure insecurity actually lie beyond the institutional recognition of land use rights.

4.3.2 Agrarian dynamics, peasant debt and social differentiation

As underlined in the historical overview, irrigation has been developed in Cambodia and Myanmar in close conjunction with paddy cultivation. The dynamics of irrigated tenure must then be considered as part of the wider agrarian transformation witnessed in the two countries, particularly since the agricultural intensification encouraged by governments since the early 1990s.

Along with agricultural intensification, irrigation participates in shaping what Hall, Hirsch and Li [16] define as 'powers of exclusion' (namely regulation, force, market and legitimation). At the landscape level, the development of irrigation induces novel socio-spatial configurations by creating a hierarchy of areas that can be evaluated based on their access to water (*i.e.*, fully, partly or not irrigated). In turn, the relative availability of water in these areas determines their potential for agricultural intensification. This socio-spatial reordering has different dimensions that interact with social, cultural and economic transformations at work in these countries.

First, the institutions devised to manage and control water have a prominent role: in both Cambodia and Myanmar, social relations are heavily organized and structured along authority lines, and the use of political intimidation or violence to force a decision is common practice [13], [17]. In the water sector, it has a bearing on the daily decisions that farmer water user communities (FWUCs in Cambodia; WUA (Water User Associations) in Myanmar) can effectively make, and on the control these groups have over the resources [18], [19]. It also has significance in respect of the delineation of exclusion zones for the use of resources [20]. The exercise of power and the use of force by influential and well-connected individuals engaged in agricultural businesses generates exclusion and leads to conflicts [21], [22].

Second, the potential for agricultural intensification - including through irrigation - transforms land values. Given the increasing commodification of land and other aspects of production in Myanmar and Cambodian rural societies, access to land and assets increasingly depends on farmers' economic capital, and there has been a generalized uptake of credit for productive and non-productive purposes. Access to credit and indebtedness have been a structural feature of Burmese agrarian society since the late colonization period [11], [23]. Irrigation-based intensification, particularly through the introduction of dry-season rice, reinforced socio-economic differentiation between large-holders capable of investing and absorbing financial stress, and smallholders unable to invest in the dry season rice cultivation over their entire landholding, therefore leading to distress land sales [11], [24]. The differentiation in land access between Cambodian farming households depended mainly on the availability of family labour until 2010. With the late introduction of agricultural intensification policies, including the development of irrigation, Cambodian farmers uptake of credit for productive and non-productive purposes became widespread. In cases of consecutive bad harvests (due to climate hazards, or pests, and occasional economic stresses - health expenses, funerals, etc.), many smallholders have had to sell part, or all, of their agricultural land to tackle financial crises. The introduction of irrigation has reinforced this mechanism as systematic double-cropping implies higher debts (to finance higher agro-chemical costs) and more risks for farmers in a context where the market fluctuates from one year to another. Farmers do not derive enough revenue from market sales, and irrigation does not fully buffer against fluctuating water supplies due to infrastructure design flaws and lack of sustained maintenance. This mechanism of land accumulation/loss is at work within villages but also well beyond. One type of land transfer that has become widespread in the Kanghot command area, for instance, relates to transactions between outside landowners based in Battambang city who buy the land from indebted farmers but rent it back to them [25].

Finally, the construction of new infrastructure in Myanmar and Cambodia and the availability of irrigation water incentivize agricultural expansion and a demand for individual, exclusive and private land rights. The extension of small-scale agricultural frontiers onto State land creates fuzzy land categories, generates land tenure insecurities, and challenges pre-existing modalities of resource access and use. Institutional pluralism becomes the norm, results in hybrid land use and tenure regimes and often ends up in full privatization of resources previously held in common [26].

The extension of irrigation in the agricultural landscapes of Myanmar and Cambodia has introduced new forms of exclusion and has catalysed existing ones. The powers of force, market, regulation, and legitimation are at work, often in conjunction with each other, to form socio-spatial configurations that shape access to water and the ability to engage in agricultural intensification.

It is worth stressing that the underlying forces that generate these outcomes are at play regardless of whether agriculture is irrigated or rainfed. Rather than creating them, irrigation can reinforce these exclusionary processes if adequate measures are not put in place. More attention should be given to understanding agrarian and resource tenure dynamics in the design and implementation of the design phase of irrigation projects.

4.3.3 Irrigation and the multi-functionality of wetlands

In wetlands, today's agricultural frontiers and irrigation expansion brings about a series of issues related to agriculture, fisheries, environmental conservation, and the coordination between the public sectors governing these activities. In Myanmar and Cambodia, seasonal floods means wetlands are both sites of rice cultivation on land and fishing in open waters, in close succession. These variations are fertile grounds for conflicts over resource claims between different uses and users. They can be seen as new hidden frontiers of irrigation expansion.

The Ayeyarwady Delta - a hot spot of irrigation in Myanmar - is such a hybrid environment. Based on a case study in Nyaungdone island, Ivars and Venot [27] showed how resource dynamics in the Delta are not only about claims and counterclaims over resources but are mobilized, politically, by the State. Under the British administration, the delta was seen as a rice frontier, and fisheries were managed under the system of Inn - fishing grounds in deep water areas leased through annual auctions to private entrepreneurs, and often sub-leased to smaller operators. The Inn helped generate revenue for the colonial government but the policy priority remained rice over fisheries that were considered detrimental to the drainage of the Delta - a prerequisite to extending rice cultivation [26]. After independence, policies to boost rice production served to contain anti-government insurgencies, and when the military strengthened its grip on the country, large tracts of deep water area were categorized as wasteland (underutilized) and allocated to private entities for farming, reducing the space devoted to the Inn fisheries. These reforms reintroduced exclusionary processes running against small-scale farmers and fishers [27]. In 2011, the political transition to a quasi-civilian government marked yet another shift in the use and management of the Delta resources. The 2012 the Ayeyarwady Region Freshwater Fishery Law laid the ground for the reallocation of the Inn to small-scale fishers and the return of land grabbed as part of the wasteland instruction to their original owners, although implementation has been incomplete to date.

This socio-political making of flood plain is reminiscent of Cambodia, although this comparison is limited to recent history. Between 2000 and 2012, efforts to boost irrigation proceeded in tandem with the progressive demise of the fishing lots system that are similar to the Inn. In areas released from fishing lots, the Fisheries Administration established Community Fisheries. But the transfer of roles and responsibilities to local communities was incomplete and has not enabled Community Fisheries management to become a credible alternative to fishing lots for sustainable fisheries management [28]. In addition to Community Fisheries, the fisheries administration has also established protection zones (e.g., flooded forest zonation around the Tonle Sap) and fish sanctuaries, some of which have been transferred to the Ministry of Environment as part of the Protected Areas system. While all these efforts are aimed at the sustainable management of natural resources in wetlands, they are poorly coordinated with the massive investments and stakeholders involved in irrigation development. The conjunction of the withdrawal of fishing lots and the development of irrigation incentivized a process of agricultural expansion into wetlands areas across the country, as observed

for instance in Ou Sanda, the Prasac area, and Trapeang Chrey/Chrouy Snao. Once in motion, these dynamics are difficult to contain because they have received considerable support from the public sector at various levels and are well aligned with the modernization policies of the government. But they are at odds with new fisheries and environmental rules endorsed by Community Fisheries and environmental conservationists. The clearance of flooded forests and the drainage of recession water for dry season agriculture, has resulted in the rapid destruction of fish spawning grounds and encroachment into areas delineated for nature conservation. It has added pressure onto a socio-ecological system that was already in a fragile state. As such, it accelerated the collapse of inland capture fisheries. Likewise, the push for irrigation has resulted in the expansion of agricultural areas into the State domain where smallholder farmers have no, or little, security of tenure. The recent efforts by the government to enforce the protection of the Tonle Sap flooded forest is a good step towards more effective wetland resource conservation. Because the process has reclaimed land from thousands of farmers and fishermen, questions remain as to how these efforts are coordinated with stakeholders involved in the agriculture, irrigation, and fisheries sectors.

5. RECOMMENDATIONS FOR A BETTER INCLUSION OF LAND TENURE ISSUES IN IRRIGATION INVESTMENT

There is a need to better account for the land use and tenure dynamics that comes with irrigation investments.

Land tenure issues revolving around irrigation are multi-sectoral and go well beyond the command areas *stricto sensu*. Irrigation development relates to water and agriculture but it also has a bearing on fisheries, environmental conservation, etc. Further, irrigation reshapes agricultural dynamics inside command areas but also influences – directly or indirectly – land management around these. Likewise, irrigation institutions stretch well beyond the prerogatives of a single sectoral ministry focused on infrastructural work to involve other public sectors, as well as private actors, community-based groups, and patronage networks. The multiplicity of land uses and users requires coordination and attention to overlapping claims and conflicts. Land use planning that replaces irrigation in its broader agro-ecological context can be a useful tool. Typically, land use planning helps to situate agricultural development in relation to natural resources, settlements and infrastructure, and the different modes of governance of these other land uses (concessions, Protected Areas, community-based management, etc.). It is a tool to clarify the diversity and complexity of land issues, and to identify development/conservation trade-offs, potential conflicts and synergies to chart future land use options. A land use planning process could be initiated during the feasibility study of new irrigation investment. It requires the involvement of different sectors and territorial authorities, and the participation of the local population is crucial to ensure the plan captures their actual needs and potential. It is important to institutionalize the land use plan at ground level with local authorities and other community-based initiatives.

Ensure multi-functionality. When irrigation is being developed in wetlands, it is key to devise mechanisms to ensure multiple access, use and control of land and water resources. This requires particular attention to how infrastructures are designed and managed to allow for fisheries-friendly agricultural development. This would notably entail developing genuinely integrated approaches to wetland management, which are currently lacking in both Myanmar and Cambodia.

Addressing the increase in land value. The Myanmar and Cambodian governments and donors alike clearly conceive irrigation as a tool for increasing the value of land - through increased agricultural production. It seems, however, that such value is considered from a purely technical point of view (its fertility and suitability for agriculture). There is no further consideration for the inclusion of land as an asset and an object of transactions that can have serious socio-economic impacts on smallholders due to the dynamics of land accumulation and land loss associated with the land market and credit transactions. The different irrigation situations documented in this study show a pattern of 'land accumulation versus wage labour', characterized by the emergence of an unequal agrarian structure whereby land is concentrated not only in the hands of well-off farmers but also in those of outsider investors who capitalize on distressed land sales by indebted farmers. There is currently no mechanism to track both these land and credit transactions. We recommend establishing a land transactions monitoring system, which is also key in the perspective of identifying the people liable to pay the irrigation service fees for the sustainable operation and maintenance of irrigation systems. We also recommend establishing a support service that helps local groups to monitor and accompany the uptake of micro-credit for productive and non-productive purposes as well as to provide appropriate services and advice to avoid over-indebtedness and ensure repayment. Such a support service would be mainstreamed with other extension services that local groups receive - for instance, the maintenance of infrastructure, the management of water, agricultural extension and training, etc. The support service would also work as an early warning system that issues alerts about the risks of land loss and creates a socio-economic mechanism that would limit the marginalization of smallholder farmers due to rapid and unregulated agrarian modernization.

6. KEY MESSAGES

- Irrigation has long been paired with rice production as a State-making project
- There is no specific tenure regime for the governance of irrigated land
- Irrigated land tenure is not a hotly debated topic due to relative clarity in land tenure. As such it is paid scant attention in irrigation investment projects
- Irrigated land tenure issues relate to patterns of socio-economic differentiation among smallholders in relation to liberal (agricultural) development policies, the extension of irrigation in multifunctional wetlands, and unequal opportunities for land securitization.

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