Irrigated Agriculture in Malaysia and Vietnam: A Comparative Analysis of Water Governance Strategies

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Abstract

Irrigated agriculture has the potential to ensure food security, contribute to sustainable management, and preserve freshwater resources. At the same time, it is connected to problems such as water scarcity, environmental degradation and pollution, and poverty. This so-called “wicked” nature is addressed by comparatively analysing the strategies used for water governance in irrigated agriculture. To highlight its cross-sectoral nature, the concept of cross-sectoral alignment is introduced based on three governance criteria. The Southeast Asian countries of Malaysia and Vietnam are used to compare strategies as their differing political systems may lead to varying strategies and can thus offer greater insight into regional water management practices. The analysis suggests that the governance strategies used for irrigated agriculture have many similarities but also distinct differences. In particular, the influence of ODA in Vietnam as well as the way farmers are included in water management stand out in regards to the differences. Similar, however, are organisational set-ups, sectoral fragmentation, and insufficient supply of participatory mechanisms as well as generally low alignment across all categories. In consideration of the global importance of water management practices, only the aligned management of freshwater resources can increase environmental health and food security in the long term.

Keywords: Integrated water resources management, water governance, irrigated agriculture, water management, water resources

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Introduction

Irrigated agriculture uses seventy per cent of freshwater resources worldwide. At the same time, projections show that in order to feed a world population of 9.1 billion people in 2050, overall food production will have to increase by approximately seventy per cent (FAO 2009: 2; IAEA 2019). Irrigated agriculture addresses the interrelation of land and water management as well as issues such as water and food security in both developed and developing countries worldwide. The governance of freshwater resources in irrigated agriculture can have an immense impact on food security and people’s livelihoods. Due to its association with other issues such as land management or energy security, water governance is considered a “wicked problem”—that is a problem with multiple overlapping and interconnected subsets of problems which affect various interest groups, thus calling for an integrated approach. Therefore, sustainable and efficient water governance in irrigated agriculture is one of the crucial issues to be addressed in the coming decades.

This article aims to improve the theoretical as well as empirical understanding of water governance in irrigated agriculture with a focus on two countries that should, in theory, have sufficient freshwater resources: Malaysia and Vietnam. Both countries offer different case studies as a result of distinctive characteristics, such as their respective political systems or agricultural sectors’ contributions to gross domestic product (GDP)—8.2 per cent in Malaysia and eighteen per cent in Vietnam. Their close geographical proximity, however, as well as similar practices for irrigated crops may have led to similarities in how water governance in irrigated agriculture is approached.¹

The framework and analysis are guided by determining the similarities and differences in irrigated agriculture in both countries. The analysis is based on the alignment perspective for water governance in irrigated agriculture, which was first developed by Özerol, Bresser, and Coenen in 2012. It focuses on developing countries (low and middle-income such as Vietnam, and emerging economies such as Malaysia) where insufficient institutional capacity as well as social and political restrictions can make the implementation and integration of policies across sectors more challenging (Özerol, Bressers, and Coenen 2012: 58). The focus on cross-sectoral alignment highlights risks as well as opportunities for water governance in irrigated agriculture. The results can offer insights to policy makers as well as researchers alike. Consequently, similarities and differences in both countries’ approaches can be determined and allow for deductions about possible regional patterns and areas of improvement for scholars as well as policy makers. Utilising the results can further help to facilitate increased

¹ In 2020, the political structure in Malaysia changed. There may therefore have been changes to the governance structure of the water sector since the publication of this article.
sustainable growth and thus help to ensure food and water security in not only Malaysia and Vietnam but other countries too.

**Methodology**

**Integrated Approaches**

There are several different concepts for the analysis of water governance in irrigated agriculture. Many of these approaches establish frameworks that demonstrate the co-dependencies of water governance, land governance, and principles of sustainable development. Among these are integrated water resource management (IWRM) (e.g., Ioris 2009; Dukhovny, Sokolov, and Ziganshina 2013), or integrated water and agricultural management (IWAM) (e.g., Fish, Ioris, and Watson 2010). Both favour an integrative and multi-disciplinary take on resource governance and illustrate the importance of approaches that address cross-sectoral issues. IWRM in particular has become the dominant paradigm in the twenty-first century (Özerol, Bressers, and Coenen 2012: 58).

IWRM is defined by the Global Water Partnership (GWP 2019) as “a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of ecosystems.” Its six main dimensions are listed by Gain, Giupponi, and Benson (2015: 895) as follows: (1) Integration and coordination of public policy and human activity; (2) spatial scales of water management; (3) accountability and transparency of governance mechanisms through decentralisation of decision-making processes; (4) stakeholder participation; (5) fair distribution of water resources; and (6) demand management. Özerol and Newig (2008: 640) explicitly note the participatory nature of IWRM since “integrating social, economic, institutional as well as environmental aspects, integrated water resources management (IWRM) has emerged as a participatory approach for the coordination of water related resources.” The complex nature of participative processes, depending on aims and rationales of the actors involved, can cause IWRM and public participation to face several challenges in its implementation, mostly rooted in insufficiently developed communication practices as well as capacity-development. Focusing on IWRM’s transformative power for the management of water resources, Tropp (2007) suggests greater focus on governance’s complexity. According to him, structures need to be flexible as well as stable to mediate conflicts between different stakeholders, including disadvantaged groups as well as actors that are not directly related to the water sector, thus establishing a more inclusive framework for water management.
Frameworks that specifically acknowledge the interrelation of water and agricultural governance are not unheard of but are not as broadly represented as IWRM. Research is mostly focused on water governance but only a few frameworks explicitly deal with water governance in irrigated agriculture, thus creating a research gap. One concept combining both is integrated water and agricultural management (IWAM). The requirements of IWAM indicate that a fragmented sector is a hindrance to policy-making processes, the successful implementation of policies, and the realisation of sustainable development. Co-dependencies across sectors are addressed but there is no established framework for IWAM due to its highly complex nature (Fish, Ioris, and Watson 2010). Other research addressing irrigated agriculture specifically focuses on pricing mechanisms as incentives (Dinar and Mody 2004), agricultural intensification by closing yield gaps (Mueller et al. 2012), the importance of incentive structures for water governance (Araral and Wang 2013), or increasing water productivity (Bossio, Geheb, and Critchley 2010). Regarding Asia specifically, Chartres (2014) centres his approach on food security and water scarcity issues and examines critical factors such as the modernisation of irrigation infrastructure as well as techniques to improve irrigation efficiency. Meanwhile, Lam (2006) addresses institutional design in Nepal and Taiwan and concludes that specialised institutions achieve better irrigation performance.

All frameworks for water governance in irrigated agriculture face a shared challenge, namely not only to consider policies and institutions that are directly associated with water resources and agriculture but also to adopt a cross-sectoral approach that facilitates the inclusion of sectors that are not directly related (Özerol, Bressers, and Coenen 2012: 60). While IWRM requires the examination of all water-user sectors rather than just the aspects of land and water, Özerol, Bressers, and Coenen (2012: 59) developed an approach that focuses on interactions and tensions across relevant policy sectors but does not demand the inclusion of all sectors dealing with water. Their framework expressly addresses the scales of water governance in irrigated agriculture and the alignment across sectors. Thus, even though it is based on IWRM principles, this concept lends itself well to analysing the state of water governance in irrigated agriculture and comparing countries accordingly. Their framework is based on the conceptual model of governance by Bressers and Kuks (2003), which displays the multifaceted nature of governance systems through five interrelated elements.
Subsequently, the authors introduce three additional criteria that support the analysis of cross-sectoral alignment: Actor representation, issue boundaries, and working procedures. These criteria have relevant categories which relate to different dimensions of the governance model. The indicators relate to their respective categories and provide the basis for the analysis of country cases.

| Criterion                        | Category                              | Indicator                                                                                                                                  |
|----------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| **Actor Representation**         | (Organisation across) Levels and Actors| Involvement of actors from multiple sectors                                                                                               |
|                                  |                                       | Organisational structure                                                                                                                 |
|                                  |                                       | Representation of governmental actors at local, regional, and national levels                                                                |
|                                  |                                       | Representation of non-governmental actors at local, regional, and national levels                                                             |
| Participation                    |                                       | Existence of participatory mechanisms                                                                                                       |
|                                  |                                       | Farmers are key actors in agricultural water management (e.g., through WUAs)                                                                 |
|                                  |                                       | Communication is balanced/two-way                                                                                                            |
| Resources                        |                                       | Power is distributed evenly among actors                                                                                                   |
|                                  |                                       | Actor dominance                                                                                                                            |
|                                  |                                       | Dichotomy between supra-national organisations and national strategies                                                                     |
| **Issue Boundaries**            | Problem Definitions and Objectives    | Representation of irrigated agriculture across levels                                                                                       |
|                                  | Alignment of national and local practices | Existence of comprehensive databases                                                                                                      |
| Networks and Instruments         | Boundary organisations / Collaborative bodies | Instruments used                                                                                                                          |
|                                  | Instruments used                      | Instruments used to explicitly improve resource efficiency                                                                                   |
|                                  | Existence of monitoring system for fertilisers, pesticides, and their impacts on soil and water | National planning documents                                                                                                                  |
| Strategies and Instruments      | Actor in charge of investment/distribution in irrigated agriculture                                                               |
Table 1: Criteria of Cross-sectoral Alignment. Source: Adapted from Özerol, Bressers, and Coenen (2012: 59).

| Working Procedures | Promotion of water-saving irrigation methods |
|---------------------|---------------------------------------------|
|                     | Training for farmers                        |
|                     | Legislative frameworks                       |

Criterion 1: Actor Representation

( Organisation across) Levels and Actors

Actor representation in natural resource governance has to take the multi-actor and multi-level nature of governance into account (Özerol, Bressers, and Coenen 2012: 59). On the one hand, the most straightforward driver for the development of water resources is the unified interests of all “influential” actors (Molle 2008: 218). On the other hand, it is understood that governance can be perceived as “the consequences of the interplay between attempts to intervene by all the actors involved” (Bressers and Kuks 2003: 65). Thus, water governance in irrigated agriculture’s multi-level and multi-actor nature describes the organisation across levels and actors and aims to facilitate a clearer understanding of the setting in which stakeholders operate. The category further examines how actors are organised as well as who is involved in decision-making processes. For effective and inclusive water governance, influential actors and decision-makers need to be outlined. At the same time, the respective network of actors depends on whether the government chooses to either assume a more prominent or a more peripheral position (Bressers and Kuks 2003: 65). Although “influential actors” may refer to whoever is allowed to participate in the planning processes, groups of actors can still unite and build coalitions to maximise the chances of promoting their own interests (Molle 2008: 218). Nevertheless, there is an increasing awareness that it is not solely the government that decides the development of different sectors of society but that development is determined and created through the interactions of several actors (Bressers and Kuks 2003: 1). This shows that the central elements are not only comprised of governmental actors but also involved non-governmental organisations (NGO) as well as farmers who are often represented in the form of water-user associations (WUA) that collectively represent their needs.

The organisational structure should not only include governmental agencies as decisions may be made based upon the interplay of multiple actors. Directly related are certain specifics of the organisational structure, such as top-down and bottom-up approaches and decentralised or centralised structures. Centralised organisational structures are exemplified by a top-down approach and a power accumulation at a high level of government, whereas a decentralised approach can be signified by policy-makers seeking out assistance from other stakeholders, such as water-user associations, or in a public decision-making process (Lai and Cistulli 2005: 2; World Bank...
Decentralised organisational approaches enable the inclusion of local stakeholders and are therefore conducive to cross-sectoral alignment. Current literature on water governance states clearly that water management institutions are most effective when they are managed and developed on the local level, making a decentralised approach to water governance in irrigated agriculture preferable (Vaux 2011: 21–22). Local water users have the best knowledge of the needs of the local irrigation systems. Making use of this knowledge can improve irrigation techniques, if coupled with capacity-building initiatives. Furthermore, decentralising irrigation governance can lead to improvements in irrigation, water equity, reduced water conflicts, and more sustainable and efficient irrigation overall. This, in turn, can lead to collective action among farmers and incentivises them to engage in more sustainable irrigation management as they have more expertise to develop appropriate rules and measures compared to government agents. Decentralisation, however, is not the panacea of irrigation management; the World Bank (2013) lists possible dangers, such as elite capture and corruption, no possibility of holding representatives accountable for actions, fragmented knowledge, and insufficient capacity building at the local level. A mixed system of decentralised and centralised measures seems to be the best option for managing irrigation and related resources (Zhou 2013: 77). Moreover, the levels of (government) actors involved nationally, regionally, and locally have to be examined.

A diverse organisational structure can indicate a decentralised system but also unaigned resources and decision-making processes (Özerol, Bressers, and Coenen 2012: 61–62).

Participation

Participation indicates mechanisms that enable the public to engage in (political) decision-making processes. Decrees such as the Aarhus Convention\(^2\) are not commonplace. Public participation can have several benefits, such as increasing public awareness, understanding problem dimensions, and stakeholder interests. It does not, however, include power politics or individual actions (Beierle and Cayford 2002: 6). When decision-making processes are closed-off from the public or shielded from those affected by a project, the result can be unbalanced governance decisions and a de-politicised public (Molle 2008: 222–223). Farmers should be among the key actors in irrigated agriculture. A common means to include them in decision-making processes is via WUAs. However, if WUAs remain unacknowledged by state authorities, participatory actions cannot progress effectively. Decentralised systems in which farmers are key actors perform better with more efficient operation and management

\(^2\) The Aarhus Convention entered into force in 2001 and deals with participatory mechanisms in environmental matters. The full text can be found under UNECE 1998: online (https://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf).
(O&M), greater productivity, and an increased collection rate of water and irrigation fees. Therefore, participatory resource management correlates with higher performance, as claimed by Hussain (2004: 4). Furthermore, communication should be balanced and two-way, which usually establishes authorities as the information provider and disregards local needs or experiences. Participation can help to create a bottom-up approach that enhances interaction between agencies (horizontal) and across local, regional, and state boundaries (vertical), thus tying in to what is also required and advocated by IWRM. Participatory irrigation management—as well as the transfer of irrigation management to farmers—was implemented in many Asian countries around twenty to thirty years ago. If, however, the responsible agencies are not reformed accordingly, such initiatives are regarded as ineffective (Chartres 2014: 33).

Resources

A dominant actor in water governance can shape the discourse according to their needs and interests. Going hand in hand with a lack of representation, a single actor in the form of, for instance, a ministry or governmental agency, can hinder a comprehensive and sustainable policy process that is inclusive of all relevant stakeholders. This can be enhanced by the competition for resources among different institutions as well as overlapping or undefined areas of responsibility. This can occur after, for instance, elections or ministerial restructuring, resulting in unaligned resources among other consequences. Nevertheless, cooperative arrangements between agricultural and water bureaucracies can still exist. Such arrangements advance efficient water governance for the irrigated agriculture sector (Özerol, Bressers, and Coenen 2012: 62).

Sometimes, there are supranational organisations that eclipse national guidelines. The European Union (EU) serves as an example and can issue supranational frameworks that override those of national bureaucracies, such as the EU Water Framework Directive. These organisations are, however, limited in number. More often, supranational organisations can give advice or make demands in exchange for investment. Comparable conventions are most likely found at the United Nations (UN), the World Bank, or the World Trade Organisation (WTO), and possibly the Association of Southeast Asian Nations (ASEAN) in the case of Southeast Asian countries. The implementation of supranational agreements can have an immense effect on national policies and working procedures as frameworks and working procedures need to be adjusted.
Criterion 2: Issue Boundaries

Problem Definition and Objectives

Cross-sectoral issue boundaries are defined by problem definitions and objectives as well as networks and instruments used. Discussing the different levels of a problem, as well as policies, legal requirements, and planning documents, the issue boundaries criterion focuses on problem prioritisation and the range of instruments used to address the problem. As stated by Özerol, Bresser, and Coenen (2012: 60): “Cross-sectoral issues can have implications at all governance levels. Therefore, the processes that occur at each level as well as the interactions among different levels need to be deliberated in every policy sector.”

Irrigated agriculture can have different emphases, such as the provision of workplaces or a means to increase national food security. It can, however, be a challenge to align local, regional, and national practices. Yet alignment across levels is difficult to measure and achieve. Combined knowledge databases or actors that are explicitly active across sectors can be indicators for good alignment. Combined databases counteract the fragmentation of knowledge that occurs naturally when an issue is spread among sectors and actors. Thus, actors that engage across sectors can further the alignment of national, regional, and local practices.

Networks and Instruments

Institutional arrangements need to be able to respond to complexities. Networks and instruments can take on several forms in water governance in irrigated agriculture. Technologies, institutions, and policies that are connected to irrigation have the ability to increase agricultural output. Irrigation can also generate higher productivity, income, employment, and wages. Having constant access to freshwater resources enables less risky investments in new seeds, pesticides, and fertilisers for farmers, and consequently leads to increased yields and decreased environmental impacts (Hussain 2004: 1–2).

Networks depend heavily on cross-sectoral and cross-level interaction within the network. So-called boundary organisations combine politics, science, and lay knowledge to involve actors from all sectors and levels, but linking these different kinds of knowledge can be a challenge. Such networks can have the power to encourage collaborative action and address issue boundaries that would otherwise have remained unnamed. Tools to improve resource efficiency can be found in efficiency pricing mechanisms, quality control standards, or infrastructure services. Other instruments used in irrigated agriculture can be of a financial nature, such as investments, subsidies, or grants. However, instruments have different effects, such as increasing employment, capacity, or productivity.
As a common tool, pricing mechanisms are of particular interest. They can take on several forms and have to be adapted to a local setting. While WUAs represent farmers’ interests and demands, they also collect water fees and re-invest them in irrigation infrastructure. They can help to achieve farmers’ cooperation and act as a mediator between water-users and authorities. Decentralised systems with high water fees are considered to be able to sustain more equitable distribution of freshwater resources and have a positive impact on sustainable water use. Irrigation fees in many Southeast Asian countries are markedly different, causing:

a vicious circle of poor irrigation performance, leading to low agricultural productivity and the perpetuation of poverty. Fees in this region tend to disappear into central government coffers and are not earmarked for recycling to irrigation managers for improved system performance (Hussain 2004: 4).

Irrigation infrastructure has to be maintained to operate efficiently and without water loss. Leaks can lead to waterlogged soil and salinisation. Techniques such as precision irrigation and land levelling can improve resource efficiency further, increasing crop yields while reducing water use. The drawback of such modern techniques, however, is that they require the often costly training of water-users. Aquifers are an efficient means for water scarce countries to store freshwater resources and evade problems such as water loss or sedimentation while continuing irrigation through periods of water scarcity or drought (Hussain 2004: 5; Vaux 2011: 20).

Where applicable, monitoring systems for the use of pesticides and fertilisers as well as instruments to improve water and resource efficiency (e.g., crop insurance, quality control, or infrastructure services) should be taken into consideration. Moreover, national planning documents can give insights into goals and attainments in the water and agricultural sector (Özerol, Bressers, and Coenen 2012: 63). While increasing output and efficiency, pesticides and fertilisers are often used in excessive amounts when seen relative to their benefits. Poisoning through exposure is a risk for agricultural workers with up to 20,000 deaths per year (Sharma and Sanghi 2012: 4). Caused by inadequate monitoring of pesticides and neglected or ignored regulations, many of these deaths occur in developing countries. Monitoring systems that not only monitor water flow but also pesticide and fertiliser usage can counteract these challenges if implemented diligently (Sharma and Sanghi 2012: 3). Lastly, although often symbolic, planning documents outline focus areas and issues faced by the sector. They give insight into the prioritisation and definitions of problems faced.
Criterion 3: Working Procedures

Strategies and Instruments

The implementation of policy instruments requires coordination among actors and sectors. To avoid negative externalities, resources should be used at an “optimal” level, which is near impossible to realise in practice. For irrigated agriculture, negative externalities include damage to the environment and human health through overexploitation of resources as well as water pollution. Moreover, irrigation can have positive as well as negative, and long-term as well as short-term effects on different types of people, particularly landless labourers, poor urban dwellers, or small-scale farmers. Although cheaper food and higher incomes can be generated through irrigation practices and thus reduce poverty, these positive effects may yet be outweighed by the negative externalities for the environment and health (Barker et al. 2004: 40; Lipton, Litchfield, and Faurès 2003: 425).

Sectors shape and implement policy instruments according to their needs; consequently, friction and overlaps can occur. In the case of irrigated agriculture, overlaps with land and water development can be observed. Many issues that are directly related to irrigation also concern other sectors. Soil salinisation, water-logging, or subsurface drainage are only a few examples. These issues can be addressed through capacity-building projects that span different sectors and in-depth training for farmers that empowers them to implement projects sustainably. Furthermore, investment in irrigation is not only carried out by the government but the private sector as well. Private sector companies invest in irrigation infrastructure and therefore contribute to economic growth and sometimes employment. This ties in directly with the promotion of water-saving irrigation techniques. Sustainable irrigation management requires training and the building of capacity. When training on the use of sustainable techniques is not provided, alignment remains low.

Legislative frameworks pertain to working procedures and cross-sectoral alignment as they outline responsible actors. Similarly to planning documents, they also highlight problem-awareness. Nevertheless, laws and regulations can be incomplete, ineffective, difficult to access for citizens, or even unknown to the relevant actors (Fritz, Kaiser, and Levy 2009: 45–46).

Case Study: Irrigated Agriculture in Malaysia and Vietnam

Country Background: Malaysia and Vietnam

Asia, as the world’s driest continent, has a per capita availability for water of only 6,380m³, which is half of the world’s average. Vietnam is considered close to water-
stress whereas Malaysia is an exception as it is not considered water-stressed yet (Chellaney 2012: 143; Hezri and Dom 2017: 26).

Malaysia is heavily reliant on its agricultural sector. 1.6 million people (of its population of 31.2 million people) are economically active in agriculture; the agricultural sector as a whole made up 8.2 per cent of GDP in 2017 (World Bank 2016; Aquastat 2011a: 3; DOSM 2017, 2018). Many areas are prone to flooding due to monsoons in the northeast and southwest (Aquastat 2011a: 1). A dense network of rivers and streams permeates peninsular Malaysia. The river network is comprised of 189 main basins (> eighty km$^2$) and has a total of 2,986 basins (DID 2017). Rivers supply ninety-seven per cent of water resources and are the main water source for industrial, domestic, and agricultural supply (Hock 2008). Nevertheless, there are many parts which face water stress and scarcity, resulting in severe drops in water levels, and thus adding a new dimension to the importance of sustainable water governance in water rich countries (Chan 2009: 144). Total water withdrawal in 2005 was approximately 13,210m$^3$, with thirty-four per cent of this being used for agricultural purposes. Irrigation mostly uses surface water. Groundwater availability is limited and only five per cent of pumped groundwater is used for irrigation purposes (Aquastat 2011a: 5).

Arable land is approximately forty-three per cent of the total land area but in 2009, only fifty-three per cent of arable land was cultivated (Aquastat 2011a: 1). Compared to 2015, paddy production increased by 28.2 per cent in 2016. This amount, however, decreased again in 2017 for no specified reason (DOSM 2018). Permanent crops are in the majority, with the remainder being made up of annual crops, such as rice. As a highly water intensive crop, rice is also the main recipient of irrigation. The paddies are cultivated by individual farmers who have small fields of one to two hectares (Aquastat 2011a: 8; PEMANDU 2010: 524). In Malaysia, irrigation development is concentrated in the eight major granary areas. There were 932 irrigation schemes in 2012 on Peninsular Malaysia and Sabah (north Borneo), including eight granary schemes dedicated to permanent paddy production, seventy-four mini-granary schemes and 850 non-granary schemes (Toriman and Mokhtar 2012: 361–363). Yet the share of agricultural land equipped for irrigation has been in decline.

In contrast, Vietnam’s agricultural sector contributes eighteen per cent to the country’s GDP. Forty-eight per cent of the labour force is active in the agricultural sector which uses eighty per cent of the total water resources (Sagris et al. 2017: 10). Vietnam has sixty main river basins and a network of approximately 2,360 rivers longer than ten km. The four main basins are Red-Thai Binh, Mekong Delta, Dong Nai, and South East Cluster. Together, they generate around eighty per cent of Vietnam’s GDP. Predictions suggest that they will also be under water stress by 2030 (Sagris et al. 2017: 7). Monsoon rainfall is irregular and results in the inconsistent availability of

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3 The eight major granary areas are Muda (MADA), Kemubu (KADA), Kerian Sg. Manik, Barat Laut Selangor, Seberang Prai, Seberang Perak, Ketara (Besut), and Kemasin Semerak (FAO 2001).
resources, causing seventy-five per cent of yearly runoff to be generated in three to four months. Furthermore, sixty per cent of Vietnam’s water resources come from transboundary rivers and are thus affected by water-usage and policies of upstream countries (Aquastat 2011b: 1–6). Agriculture accounts for 94.8 per cent of total water withdrawals. Similar to Malaysia, groundwater withdrawals are low at 1.7 per cent of total water withdrawal and are not used significantly in irrigated agriculture (Aquastat 2011b: 6; Sagris et al. 2017: 8).

Of the country’s total area, twenty-nine per cent was cultivated in 2011. Surface irrigation accounted for 99.98 per cent of the area equipped for irrigation while sprinkler irrigation accounted for only 0.02 per cent (Aquastat 2011b: 3). As in Malaysia, rice is the major crop in need of irrigation, accounting for eighty-two per cent of the irrigated area. A full eighty per cent of total water resources are used for irrigation. However, merely fifty-five per cent of arable land is equipped with irrigation infrastructure. The key agricultural areas are located in the Red-Thai Basin and the Mekong Basin. To contextualise the magnitude of water demand, it is expected that irrigation water use will have to increase by thirty per cent by 2020 (ADB 2009: iv; Sagris et al. 2017: 10). The area of land equipped for irrigation, however, has actually declined.

Vietnam’s farms are even smaller than those in Malaysia, with an average of 0.2 hectares. Only the Mekong Delta has larger farms with 1.2 hectares on average, thus making small and fragmented farm land commonplace (Marsh and MacAulay 2003: 4). Nevertheless, irrigation is the major benefactor of agricultural spending in Vietnam and contributes to growth in exports and agricultural employment.

Actor Representation – Organisation across Levels and Actors

Irrigated agriculture actors in Malaysia have a diverse organisational structure. Water resource development is sectorally managed, whereas irrigation water supply is handled by the respective agencies unilaterally (Ariffin 2013: 167–68). There are several active actors in irrigated agriculture, spanning from the national level via ministries to the regional level. However, the local level is not well-represented. The government ministries and agencies—namely Ministry of Agriculture (MOA) (national level), Muda Agricultural Development Authority (MADA) (regional level), Kemubu Agricultural Development Authority (KADA) (regional level), and the Integrated Agricultural Development Authorities (IADA) (regional level)—respectively manage water and irrigated agriculture. The Ministry of Water, Land and Natural Resources (KATS) (national level) and its agency the Department of Irrigation and Drainage (DID) (national and regional level) are also involved. Furthermore, matters concerning water management are not only under the jurisdiction of the government but also the respective state. This points to a fragmented sector with many involved institutions under
the two main water ministries (MOA and KATS) as well as other involved stakeholders such as the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC). Even though decentralisation is formally encouraged, it proceeds slowly. The national government and agencies are still in control of most of the sector (Hock 2008: 72). In addition to the fragmentation, representation of non-governmental actors for water governance in irrigated agriculture is low. No national or international NGOs are trying to shape the course of irrigated agriculture in Malaysia.

Like Malaysia, two ministries are involved in the management of water resources in Vietnam: the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Agriculture and Rural Development (MARD). The roles these institutions play in water resource management are often unclear and conflicting, causing overlapping responsibilities and resources (ADB 2009: xv). MONRE was founded with the explicit aim of increasing effectiveness, minimising overlapping responsibilities, and reducing the plethora of ministries active in the management of water resources. Vietnam’s National Water Resources Council (NWRC) fulfils the role of boundary organisation, but only has an advisory function and no decision-making power. The non-governmental sector in Vietnam is, as in Malaysia, present but not active in irrigated agriculture. However, in contrast to Malaysia, there are several multilateral organisations present that are active in the sector through investments and infrastructure projects. Furthermore, they encourage farmers’ representation through WUAs, accelerating the establishment of new means of participation such as participatory irrigation management (PIM) or irrigation management transfer (IMT). In addition, they promote decentralisation initiatives. The local level in Vietnam can be considered decentralised, while at the same time, general management and communication still follows a top-down approach. Governmental actors are represented at local or district level, yet they still have to adhere to the central government’s policies. Another actor with power to make investments and participate in land management is the Provincial People’s Committees (PPC). The PPCs are allowed to make independent decisions, causing power to accumulate on the provincial level while leaving the local level without decision-making powers.

There are several similarities across levels and actors in Malaysia and Vietnam. Both countries have two ministries dealing with water and agriculture with organisations that span from the national to the regional level yet neglect the local level. Overlaps occur between ministries but are more pronounced in Vietnam. While both countries have a mainly centralised organisational structure, decentralisation efforts have been made in Vietnam. This is also represented in the set-up of WUAs and thus non-governmental actors in Vietnam. WUAs are more strongly encouraged and therefore more common than in Malaysia.
Actor Representation – Participation

In Malaysia, farmers’ organisations exist at different levels. Many are represented by the IADAs locally and by the Farmer’s Organisation Authority (FOA), which heads all farmers’ organisations. FOA works in direct support of government policies and can be considered one of the key actors for irrigated agriculture. It cannot, however, act independently based on farmers’ needs and against government policy. Apart from these forms of representation, farmers are usually able and encouraged to represent themselves as business entities—a direct result of government policy that encourages the establishment of more farms acting as a corporate unit with shareholders. Direct involvement of farmers in the decision-making process, however, could not be found. Further fragmentation is caused by handing management of the basin level and implementation of integrated river basin management to the Department of Irrigation and Drainage (DID) without the involvement of MOA or farmers’ organisations. As a consequence, participatory mechanisms in Malaysia are considered to be insufficient. Zakaria (2013: 132) states that to increase stakeholder participation, there is a need for greater awareness and advocacy on all levels. Yet participatory decision-making processes have not been implemented comprehensively. As Hezri and Dom (2017: 30) note, “there are struggles in the water domain between centralised infrastructure and business models, and more decentralised, participative and diversified models” in Malaysia.

In contrast to Malaysia, participatory mechanisms are slightly better developed in Vietnam. There is, for instance, a national strategy for PIM. PIM enables local water users to manage irrigation at their level, thus encouraging participation in irrigation management and more efficient water use. Beyond Malaysia’s entrepreneurial farms, however, farmers in Vietnam consider themselves in charge of irrigation already, even without decentralisation initiatives (Nguyen 2018). On the one hand, this points to a lack of understanding of governance processes among farmers, and shows disregard for local practices by authorities on the other hand. So far, participatory mechanisms are mainly pushed and realised with the aid of international organisations such as the World Bank, but are not regarded with the same urgency by the central government. Power remains mainly with MONRE, MARD, and the PPCs, causing unbalanced communication and uneven power distribution, resulting in unaligned resources.

Both countries have participatory mechanisms, but they are more advanced in Vietnam than in Malaysia. This is caused mainly through the involvement of international organisations that encourage water and irrigation management strategies such as IMT and PIM. In Malaysia, farmers only have the opportunity to become involved through state-led organisations and cannot be considered key actors in agricultural water management.
Actor Representation – Resources

The irrigated agriculture sector is dominated by two government ministries in Malaysia: MOA and KATS. Both have the power to invest in water resource management, creating overlaps in responsibilities, competition for resources, and unaligned resources. Supranational organisations are not involved in this sector in Malaysia. Similarly, the most dominant actors in Vietnam’s water sector are MARD and MONRE. They both have responsibility for managing water and land. Furthermore, they are both huge organisations with considerable budgets for investment. There are, however, tensions, as responsibilities are not clearly defined, causing competition over decision-making powers and access to and control over resources (ADB 2009: 50; Waibel 2010: 29–30). As a consequence, power in both countries is not distributed evenly and the sector is dominated by the two respective main authorities for water and agricultural management: MOA and KATS in Malaysia, and MONRE and MARD in Vietnam. As there are no applicable guidelines imposed by supranational organisations, there is also no discernible conflict with national resource management strategies.

Issue Boundaries – Problem Definitions and Objectives

Several changes in recent years have transformed the institutional structure of Malaysia’s water sector. Run by a typical top-down approach, the irrigated agriculture sector suffers from weak links between authorities (Zakaria 2013: 128). Water and land are under the jurisdiction of the states which interferes with the federal agencies’ implementation of larger projects or the implementation of new water resource management principles. The available data on water resources is often outdated. Furthermore, according to Chan (2009: 145), much of the sector’s power is in the hands of private companies that have strong ties to the government and can make use of resources while disregarding other sectors and interests. Water resource management is hindered by administrative boundaries on each level, with different stakeholders all having their own priorities. Initiatives that further inter-agency dialogue and bring stakeholders together, however, are beneficial for alignment and the solution to inter-sectoral problems. The Economic Transformation Programme (ETP) by the Malaysian government proposes initiatives that require collaborative efforts (PEMANDU 2010). They only focus, however, on certain projects and do not consider issues that fail to pertain directly to these projects. Consequently, there is a disparity between horizontal and vertical alignment.

In Vietnam, irrigated agriculture is represented across all levels of governance; national, regional, local, and the river basin. Seen as providing food security, employment, and income, irrigated agriculture’s governmental representation spans the national to the provincial level. The local level is covered through ODA actors, irrigation and drainage companies, and WUAs which are also active stakeholders. The river
basin is represented through committees and the Mekong River Commission (MRC). Both the basin level and the local level lack power and have limited possibilities to actively influence the policy process. Although irrigated agriculture is represented across levels, the high number of actors causes fragmentation and unaligned resources. Furthermore, there is conflict between MONRE and MARD. The establishment of MONRE in 2002 caused tensions between the ministries. The intention was to separate water resource management and public service delivery. However, responsibilities were not clarified during the transition process and many have remained undefined. Infrastructure planning, for example—a considerable decision-making power—was not assigned specifically to either one and thus led to inter-ministerial conflicts (Waibel 2010: 29–30). Conflict surrounding the river basin organisations (RBO) further demonstrate this rivalry. RBOs were to be set up for the large river basins in Vietnam in order to plan water resource management, increase stakeholder involvement, and improve coordination among government agencies. While MONRE saw the RBOs as an opportunity to establish its legitimacy, MARD viewed them as a threat to its political as well as financial power (Benedikter 2014: 12; Molle and Hoanh 2009: vii; Waibel 2010: 35).

Malaysia does not have a unified national approach for water and soil pollution or the monitoring thereof. The only accessible database is the Department of Environment’s Environmental Quality Report (DoE 2018) through the Malaysia Open Data Portal. Most agencies and ministries have their own systems; fragmentation and a division of responsibilities, however, can cause data loss and loss of knowledge. Similarly, Vietnam lacks comprehensive databases and faces a divide between national and local practices through increased top-down communications.

Both countries suffer from fragmented sectors, which causes low alignment of national and local practices. Furthermore, the issue of irrigated agriculture is only represented across all levels in Vietnam, although not sufficiently. Malaysia lacks representation at the local level but has, in contrast to Vietnam, taken steps towards a comprehensive database which is accessible to all stakeholders via the Malaysia Open Data Portal.

Issue Boundaries – Networks and Instruments

The notable fragmentation of the Malaysian agricultural sector results in difficulties coordinating the implementation of policy and instruments across sectors. The recent restructuring of ministries has shifted responsibility but not decreased fragmentation. Instead of MOA, KATS is now the superior ministry of the DID, and many water related issues are under their authority. Nevertheless, MOA is still the major authority for the agricultural sector. The split between agriculture and water is not conducive to further alignment. A very similar situation presents itself in Vietnam with the two ministries of MARD and MONRE. They have overlapping responsibilities for the
management of water resources and thus unaligned resources caused by inter-ministerial competition and conflict. While Vietnam has collaborative bodies, such as the NWRC, Malaysia has the Majilis Sumber Air Negara (MSAN) (National Water Resources Council). However, their potential power and influence is reduced by the disinterest of the relevant ministries in both countries, thus rendering them meaningless for irrigated agriculture.

The fight against pollution is an issue in Malaysia, particularly at the basin level which is low priority on local governments’ agendas. Flood control, water extraction, and pollution levels are split across ministries and agencies. Many departments regulate and manage different services related to water. On the one hand, some agencies lack technical expertise for projects while others lack the powers to enforce laws and regulations on the other hand, causing unaligned resources. Some of these agencies have multiple responsibilities and overlaps thus occur frequently (Zakaria 2013: 126). This exemplifies the fragmentation of powers and interests in the sector. Furthermore, active boundary organisations that could address and counteract some of these problems and bring stakeholders together do not exist.

The favoured instruments in both countries are financial and infrastructural measures. In Malaysia, small-scale farms are supposed to transform to business-sized farms according to the ETP (PEMANDU 2010: 549). Government agencies support farmers through ETP projects that aim to increase the sector’s contribution to gross national income (GNI) and increase paddy farming by sixty per cent. Subsequently, an increase in rural employment as well as a rise in incomes of two to four times is expected. These projects are supported by the Entry Point Projects (EPP). Paddy productivity in the Muda area and others is supposed to strengthen and increase national food security and reduce the dependence on government subsidies. This is planned to be achieved through projects such as EPP 10’s rice paddy amalgamation project, which requires cooperation and investment across sectors and levels. The projects aims to expand irrigated agriculture by increasing the size of agricultural holdings from small-scale farmers (average two hectares) to large-scale farms (average 300 hectares). A transformation from small individual farms towards a centralised farming system would also decrease the investments needed for irrigation. MADA is supposed to act as the superior tenant operator for the project and coordinate all efforts of the involved bureaucracies.

Irrigation in Malaysia is concentrated in the large eight irrigated granary areas. Paddy cultivation mainly uses flooding irrigation where the farmers are in control of water depth. Problems such as salinisation or water-logging are not reported as critical in Malaysia (Toriman and Mokhtar 2012: 362). Malaysia does, however, suffer from frequent flooding and thus new flood mitigation projects have been implemented (PMD 2015). Financial instruments exist in the form of fees for water usage. It is, however, estimated that these fees cover only around twelve per cent of operational costs and are therefore reliant on government support. Government interventions also
come in the shape of subsidies for fertilisers, credits, and minimum prices (Toriman and Mokhtar 2012: 362–63). Pollution and quality control is insufficient in Malaysia: of the rivers monitored in 2017, fifty-one out of 477 were classified as polluted (DoE 2018). Although there are laws for the prevention of water and soil pollution, these are often insufficiently enforced or enacted (Chan 2009: 145).

Due to waterlogging, salinisation, and similar issues, there is an increased need to be resource efficient and use sustainable instruments in Vietnam. However, although farmers have been involved at a higher rate than in Malaysia through, for instance, O&M, an increase in resource efficiency has not yet been achieved. Projects that allowed for greater crop diversification and the distribution of private small water pumps have allowed farmers to control irrigation quantity individually and diversify their cropping practices. Other instruments used are tube-well irrigation, which is mainly practiced for perennial crops, Alternate Wet and Dry Irrigation (AWD), surface pumping, and small-scale canal irrigation. Even though the subtropical climate permits several crops per year, reduced water flows during the dry season causes the intrusion of saltwater and thus salinisation (Barker et al. 2004: vii; Sagris et al. 2017: 22, 41).

Irrigation fees were reintroduced in 2017 through the new Irrigation Law. The law permits flexible fees for irrigation and drainage based on the crop area and was supposed to change the perception of water and irrigation from a public good to a commodity. However, the law does not distinguish between water rich and water scarce areas, thus creating a disadvantage for farmers in arid regions (Sagris et al. 2017: 7). Monitoring systems for fertilisers, pesticides, and their environmental impact are insufficient in Vietnam. There is an environmental information and reporting system with “a national network of environmental monitoring stations, as well as environmental monitoring at the provincial level” (Aquastat 2011b: 11), and MONRE is responsible for monitoring water quality as well as identifying regulation violations.

Malaysia has several national planning documents: the Malaysia Plan, the ETP, and the major EPPs address irrigated agriculture. They focus on competitiveness in the international markets, agricultural enterprises, as well as niche products, but not on better cooperation, alignment, or sustainable irrigation practices. Higher employment rates, an increased GNI, and a modernised sector are among the chief aims while the implementation of resource efficient tools for water use is disregarded. Furthermore, the current National Agro-Food Policy (NAP 4) focuses mainly on agro-food businesses and does not outline clearly the role played by water and irrigation. Thus, these plans may be unsustainable in the long-term. Vietnam has one major planning document, the National Water Resource Strategy towards the Year 2020 (MONRE 2006), and although it is critical of the current situation regarding water resources in Vietnam, it only uses general formulations with a few possible projects mentioned in its annex. It does, however, show awareness of current problems. Having been pub-
lished in 2006, Sagris et al. (2017: 4) claim that “water resources are still mostly managed within the boundary of individual sectors and provinces; as opposed to an integrated river basin management system.”

The issue boundaries criterion and its category networks and instruments expose many similarities in the management of irrigated agriculture in Malaysia and Vietnam. While both countries have national water resources councils, they are ultimately without power. Furthermore, the instruments used to manage irrigated agriculture rely on financial aid in the form of subsidies and irrigation fees and only differ on the micro level. While there is a wide range of pricing mechanisms, credits, and subsidies in Malaysia, Vietnam’s financial instruments seem to focus mostly on the reintroduced irrigation fees and subsidies. Instruments to improve resource efficiency are more developed in Vietnam where there is a wider range of infrastructural instruments available. Malaysia focuses on the increase in farm size and projects (such as rice paddy amalgamation) to further its goals as stated in the ETP. Both countries have resource monitoring systems which are, however, split across authorities and incomprehensive. Regarding national planning documents, Malaysia has several in contrast to Vietnam. They differ, however, in focus; Malaysia’s planning documents mainly address economic development but neglect sustainable development, while Vietnam clearly addresses sustainable resource management issues in the National Water Resources Strategy towards the Year 2020 (MONRE 2006).

Working Procedures – Strategies and Instruments

Malaysia aims to consolidate land through economies of scale and transform small agricultural holdings (≤ two hectares) to agribusinesses (300 hectares) that operate in large, centrally-managed clusters with access to modern infrastructure. Developing services to increase irrigation efficiency and investment in higher-value activities are examples of the instruments used. EPP 10, increasing productivity in the Muda paddy farming area, is a prime example of such a project that also highlights how power is distributed in the sector. Implementing such plans demands the coordination of several actors across sectors and levels. Not only is MOA involved in this undertaking but it also depends heavily on farmers’ cooperation—something that can be achieved through information on the benefits of the project and training facilities. Training programmes are offered through facilities such as the Agricultural Skills Training Division by MOA, which helps farmers develop entrepreneurial skills. Even though this is in accordance with the ETP, issues such as sustainable irrigation methods are mostly neglected. Malaysia’s current pricing mechanisms for water resources are also too low to encourage sustainable irrigation. This is a strong indicator for a lack of capacity.

Better management practices could be developed as a result of stronger knowledge sharing mechanisms among actors and ensuring their availability to decision-makers,
in turn supporting Malaysia’s achievement of its objective to obtain the status of developed country by 2020 (Zakaria 2013: 132). Sustainable practices can also be encouraged through legislative measures. Malaysia’s legal frameworks, however, are not properly equipped to handle sustainable irrigation practices and are often outdated, redundant, or unclear (Chan 2009: 145; Zakaria 2013: 127). Improving integrated resource management requires legally binding codes and management principles at all levels of government (Hezri and Dom 2017: 28).

The case of Vietnam clearly demonstrates that investment and policies should not be isolated in each sector. State management is split between MONRE and MARD, with active international organisations that support agricultural investment. Many investments are undertaken by international organisations, and the National Water Resources Strategy demands “full and efficient use of ODA (Official Development Assistance)” (MONRE 2006: 19). Training and capacity development projects do not often reach the local level as MARD’s training classes for irrigation and drainage are aimed at the provincial level. Resource efficient techniques, such as AWD, crop diversification, and small pumps are encouraged and generally allow for more controlled and efficient water use. To be implemented properly, however, investment in capacity-building projects is required for farmers and government officials alike. To successfully improve resource efficiency, MARD, MONRE, NGOs, WUAs, and other farmers’ organisations as well as irrigation and drainage companies have to work together.

In Malaysia, the National Water Resources Policy combines aspects from a variety of sectors but its implementation cannot be successful without the amendment of current laws and responsibilities. Consequently, the federal states’ sovereignty over water resource management is a hindrance for alignment and integrated resources management. Vietnam faces a different situation: its comprehensive framework of laws and over 300 regulations for water and irrigation management results in an overly complex situation. The new Irrigation Law shows awareness of problem areas and puts emphasis on the need to become more resource efficient. Nevertheless, it fails to include regional differences and does not demand the provision of comprehensive monitoring systems. Thus, water resources are still suffering from unsustainable use, overexploitation, pollution, and a lack of enforcement and coordination among different levels (Sagris et al 2017: 29).

Legislative frameworks for irrigated agriculture and water resource management exist in both countries. However, they differ in scope and topics addressed. While Vietnam has a plethora of regulations pertaining to water and irrigation management, Malaysia has fewer documents. What is similar is the inconsequent implementation and enforcement of laws and regulations in both countries. The need for resource efficient irrigation has been emphasised more strongly through Vietnam’s new Irrigation Law. This goes hand in hand with the promotion of modern, resource efficient irrigation techniques such as AWD by international organisations such as the World
Bank, which also offers capacity-development and funds for such projects. The use of such techniques as well as the involvement of international organisations is not prevalent in Malaysia. Thus, while governmental actors are in charge of investment in both countries, ministries in Vietnam rely on international aid more heavily. Furthermore, responsibility in Vietnam is split between MONRE and MARD, whereas MOA is in charge in Malaysia. The category further illuminates a common lack of capacity-building projects and training for farmers, which are insufficient in both countries.

**Discussion and Conclusion**

This article set out to compare the current state of water governance in irrigated agriculture in Malaysia and Vietnam from an alignment perspective. The aim was to find similarities and differences in agricultural water management practices, while highlighting cross-sectoral issues, namely levels, instruments, and involved actors. The interconnectedness of actors and instruments across levels and scales was addressed. Not simply a “water problem,” irrigated agriculture needs to include multiple aspects. Negative impacts on soil and water threaten environmental sustainability and actors can severely impact on such a multi-faceted issue. The literature review revealed plentiful integrative concepts. Not only is there a plethora of approaches to water governance but a range of different emphases.

For Malaysia and Vietnam, water governance in irrigated agriculture is indeed a “wicked problem.” Even though aims are often similar (e.g., to increase rural employment, achieve food security etc.), strategic approaches to such issues often differ. In both countries, the share of agricultural land has grown, indicating an expanding agricultural sector and an increase in the need for freshwater resources. Yet the land area equipped for irrigation has decreased, a development which is counter-productive and counter-intuitive as both countries rely heavily on the agricultural sector. The following table shows the detailed results of the case studies:

| Criterion (Organisation across) Levels and Actors | Category | Indicator | Malaysia | Vietnam |
|-------------------------------------------------|----------|-----------|----------|---------|
| Involvement of actors from multiple sectors     |          |           | Agriculture • MOA • MADA, KADA, IADAs • KATS • DID | Agriculture • MARD • MONRE |
|                                                 |          |           | Water • KATS • DID | Water • MONRE |
|                                                 |          |           | Farmer/WUA • FOA, AFO, SFO | Farmer/WUA |
|                                                 |          |           | International • World Bank • ADB | |


| Issue Boundaries | Organisational structure | Mainly centralised | Mainly centralised | Decentralised at local level |
|------------------|--------------------------|--------------------|--------------------|-----------------------------|
| Representation of governmental actors at local, regional, and national levels | National | National | Regional | Provincial |
| Representation of non-governmental actors at local, regional, and national levels | National | National | Regional | Regional |
| | Farmer | Local/farmer (through ODA projects) |
| Participation | Existence of participatory mechanisms | Yes | Yes |
| | Farmers are key actors in agricultural water management (e.g., through WUAs) | No | Yes | IMT, PIM |
| | Farmers are involved through farmers’ organisations | Yes | IMT, PIM |
| | WUAs established (farmers’ organisations) | WUA established |
| | Communication is balanced/two-way | Top-down | Top-down |
| Resources | Power is distributed evenly among actors | No | No |
| | Actor dominance | MOA, KATS | MONRE, MARD |
| | Dichotomy of supranational organisations and national strategies | No | No |
| Problem Definitions and Objectives | Representation of irrigated agriculture across levels | National | National | Regional | Regional |
| | Alignment of national and local practices | No | Fragmented sector | No | Fragmented Sector |
| | Existence of comprehensive databases | Yes | Malaysia Open Data Portal | No |
| Networks and Instruments | Boundary organisations / Collaborative bodies | MSAN | NWRC |
| | Instruments used | Financial | Financial |
| | | irrigation fees | irrigation fees |
| | | subsidies for fertilisers | subsidies |
| | | credits | |
| | | minimum price | | Infrastructural | Infrastructural |
### Table 2: Summary of Case Study Results

| Working Procedures | Strategies and Instruments | In charge of investment/distribution in irrigated agriculture | Government | MOA | Government | MARD | MONRE | International | World Bank | ADB | AWD | Promotion of water-saving irrigation methods | Government | Capacity-building projects | Legislative frameworks | Yes | Yes |
|-------------------|---------------------------|-------------------------------------------------------------|----------|-----|------------|------|-------|---------------|-----------|-----|------|--------------------------------|-----------|-----------------------------|-------------------|-----|-----|
|                   |                           | Actor in charge of investment/distribution in irrigated agriculture | Government | MOA | Government | MARD | MONRE | International | World Bank | ADB | AWD | Promotion of water-saving irrigation methods | Government | Capacity-building projects | Legislative frameworks | Yes | Yes |

Both countries have developed an institutional structure with two dominant ministries. Responsibilities are spread across these ministries and their respective agencies. While the central government, its ministries, and the PPCs are the major actors in Vietnam, Malaysian water is managed by the government ministries and the states. Local actors are not sufficiently involved in both countries; their expertise should be brought into the governance process and taken into account through, for instance, mechanisms to increase bottom-up communication. Their inclusion can improve alignment and further the sustainable development of natural resources.

There is, however, a difference in how farmers are represented in irrigated agriculture. While both countries have water-user associations, their forms differ greatly. In Malaysia, WUAs exist only within a governmental structure. They are located under or associated with MOA and can thus not act independently and represent farmers’ interests without restraint. In Vietnam, however, WUAs can frequently be found at the local level representing farmers and their interests up to the regional level. This
development is closely related to the increased use of ODA in Vietnam, in particular when compared to Malaysia. This is reflected in the “actor in charge of distribution” indicator, which is—in addition to MONRE and MARD—the World Bank and the Asian Development Bank. It is also reflected in the involvement of actors from multiple sectors, which is made more diverse in Vietnam through the involvement of international organisations. These considerations go hand in hand with the findings on decentralisation initiatives as well as the rather sparse involvement of NGOs. Although it may seem a curiosity that NGOs are not as well represented in the irrigated agriculture sector as in others, there are several reasons why.

NGOs can be considered the connecting link between different levels as they are often active not only at the local but also the regional, national, or global levels. They thus create links between policy makers and local actors and can connect, for instance, businesses with the academic community. Another area of expertise in which NGOs are active is awareness raising and capacity building. Due to their non-governmental nature, NGOs are not bound to party lines or opinions and can express themselves and act more freely. In addition, they provide means of representation for marginalised groups such as indigenous people, women, or youth. It is, however, of note that this phenomenon occurs in both countries. Malaysia and Vietnam do not share a political system and it can thus be concluded that the problem does not lie within the political system but the sector.

Non-governmental actors are active in both Malaysia and Vietnam in water and non-water related sectors. These are sectors such as urban water management, clean water initiatives, and WASH (Water, Sanitation, and Hygiene) but not irrigated agriculture. One explanation is the high degree of specialisation irrigated agriculture demands. Moreover, the impact of the sector may be perceived differently because most investments—and thus observable changes—are long-term in nature. The costs of required activities in the irrigated agriculture sector (such as infrastructure projects) are obviously relatively high when compared to the likes of a riverbank cleaning project; it can be done with volunteers, does not require high degrees of expertise, and creates a positive public image. Such projects give immediate results that are easily observable for all, namely a clean river or better quality drinking water. Thus, it is relatively easy to succeed with such projects, particularly when compared to irrigation projects that have much less of an immediate impact on people’s livelihoods and require more resources. In irrigated agriculture, the focus lies on better infrastructure, education, and environmentally friendly techniques. Owing to the fact that NGOs are often in need of publicity to acquire resources, they largely focus on projects that not only have an internal impact, but also further their external impact and recognition.

Standing out among the findings is the trend towards decentralisation in Vietnam. Considering the management approach associated with a socialist political system, encouraging decentralisation might seem to be a surprising move. This trend, however,
can be explained through closer examination. As the findings have shown, the Vietnamese management system does not reach far beyond the regional level. The local level is often left to its own devices and, apart from farmers, is characterised by international organisations’ activities. This is particularly noticeable in areas with less well-developed infrastructure. Commenting on the current state of PIM in Vietnam, Nguyen (2018) notes that farmers already see themselves as the decision-making power in their domain. At the very least, this points to ineffective communication between the official political guidelines and the people’s day-to-day lives. The influence of NGOs or multilateral organisations such as the World Bank or Asian Development Bank encourages the process of decentralisation. Yet decentralisation processes need the expertise and knowledge of actors who are indeed active in the sector undergoing decentralisation. Their understanding of local conditions enables them to react to newly arising challenges accordingly. Furthermore, access to new knowledge and techniques for Vietnamese farmers is limited, making the deployment of professionals even more important. Lastly, there are plenty of signs that the Vietnamese government is aware of the challenges it faces in the freshwater sector. This is not only reflected in the new Irrigation Law and the National Water Resources Strategy towards the Year 2020, but it also ties in closely with the working procedures criterion and the actors in charge of distribution or investment. While the split responsibilities between two similar ministries occurs in both Malaysia and Vietnam, the latter makes decidedly more use of financial and infrastructural help from international organisations. These also invest in capacity building and the expansion of learning centres for farmers and can therefore push agendas that are of interest to them. The investment infrastructure is more clearly defined in Malaysia where investment and distribution of resources is mainly undertaken by MOA.

The two-fold ministerial structure causes conflict and friction in both countries. Although a single water authority would further alignment, Vietnam and Malaysia both have split responsibilities between different ministries. The repercussions are most visible in the fragmentation of the sector caused by additional agencies with overlapping functions, ultimately resulting in unnecessarily unaligned resources.

Regarding participation, the European Union offers an excellent example of public participation in the implementation of regulations (Özerol and Newig 2008: 648). Alas, no such approach exists for Southeast Asian countries. Even though participative processes are frequently discussed in governance literature, Malaysia and Vietnam fail to implement comprehensive practices for public participation. While PIM in Vietnam sets out to include the public in irrigation management, Malaysia only acknowledges the need for participative processes (bin Abdullah 2017) but prefers to focus its policies on entrepreneurial farm development. Participation is an important political but also inherently democratic moment that does not necessarily have the same importance in every country. Political participation needs well-developed mechanisms but also demands great(er) effort.
The use of instruments is similar in both countries and only differs on the micro-level. Financial and infrastructural instruments as well as pricing mechanisms are used but in different forms. Malaysia currently focuses on creating industrialised farms with the aim of increasing farmers’ incomes and improving national food security. In contrast, Vietnam focuses more heavily on resource efficient tools such as AWD, which is a highly advanced irrigation technique. However, both countries lack monitoring systems for fertilisers and pesticides. This can have dire consequences for farmers who risk their health if not educated about appropriate use and the environment—overused fertilisers and pesticides impact soil and groundwater, leading to further health risks for farmers as well as consumers. Monitoring focuses mainly on water quality and environmental problems such as droughts or floods. Malaysia’s Open Data Portal is a step in the right direction for providing greater transparency and access to relevant data.

Policy makers need to pay greater attention to obstacles and opportunities that have been revealed. For instance, Malaysia’s focus on economic growth neglects the importance of environmental protection. Greater engagement at the local level—making use of farmers’ knowledge, providing training on more sustainable farming practices, and investing in these approaches—could increase alignment and give greater long-term food security while generating sustainable development in both countries. Furthermore, as the analysis has revealed, alignment is low across sectors in both countries. Splitting authorities between agricultural and water management has proven to be inefficient and unconducive to alignment and sustainable, integrated water management.

The aims of stakeholders are often similar, such as increasing food security or rural employment numbers. Strategies differ, however, and are dependent not only on the political system and institutional set-up of a given country, but also the existing infrastructure, the influence of ODA, the focus on resource efficiency and sustainability, as well as the willingness to act on these paradigms. The framework has not addressed land-use or property rights, both of which can potentially impact significantly on water management and policies, as well as any restrictions and challenges that arise from global climate change. The former opens up possibilities for future research and more extensive frameworks, while the latter will inevitably have to be addressed in greater depth as well.

ABBREVIATIONS

ADB   Asian Development Bank
AFO   Area Farmers’ Organisations, Malaysia
ASEAN Association of Southeast Asian Nations
| Acronym | Description |
|---------|-------------|
| AWD     | Alternate Wet and Dry Irrigation |
| DID     | Department of Irrigation and Drainage |
| EPP     | Entry Point Projects |
| ETP     | Economic Transformation Programme |
| EU      | European Union |
| FOA     | Farmer’s Organisation Authority |
| GDP     | gross domestic product |
| GNI     | gross national income |
| IADA    | Integrated Agricultural Development Authorities |
| IMT     | irrigation management transfer |
| IWAM    | integrated water and agricultural management |
| IWRM    | integrated water resource management |
| KADA    | Kemubu Agricultural Development Authority |
| KATS    | Ministry of Water, Land and Natural Resources |
| MADA    | Muda Agricultural Development Authority |
| MARD    | Ministry of Agriculture and Rural Development |
| MESTECC | Ministry of Energy, Science, Technology, Environment and Climate Change |
| MOA     | Ministry of Agriculture |
| MONRE   | Ministry of Natural Resources and Environment |
| MRC     | Mekong River Commission |
| MSAN    | Majilis Sumber Air Negara |
| NAP     | National Agro-Food Policy |
| NWRC    | National Water Resources Council |
| NGO     | non-governmental organisation |
| O&M     | operation and management |
| ODA     | Official Development Assistance |
| PIM     | participatory irrigation management |
| PPC     | Provincai People’s Committees |
| RBO     | river basin organisation |
| SFO     | State Farmers’ Organisations, Malaysia |
| UN      | United Nations |
| WASH    | Water, Sanitation, and Hygiene |
| WTO     | World Trade Organisation |
| WUA     | water-user association |

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