



Netherlands Enterprise Agency



Water and Agriculture in Jordan: Understanding Current Water and Agricultural Priorities and Futures



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1 Objective

This project aims to build a dialogue between different water users and policy planners and makers on sustainable water use by understanding each other's current water and agricultural priorities and futures in order to map out 'ideational space' – involving stakeholders in discussions to identify their ideal and pragmatic priorities for the future of water and agriculture in Jordan.

2 Background

In the Jordanian agricultural water policy sector, there is strong awareness of the need for improved water productivity, and the technical and management means to achieve this. However, challenges still lie in finding the right social-cultural means to implement such policy change in the agriculture and water sector in Jordan. To improve both water and agricultural economic productivity, there is a need for implementation of scientifically informed policy on the ground in a coherent and socially sensitive manner and with coordination and support from across relevant ministries.

Recent research on both - drawing on response to proposals for improved water resource 'decoupling' in Jordan'^{1 2 3} and research drawing the main challenges in the water sector in Jordan⁴ - have identified a number of sticking points of the political economy that hinder effective planning and implementation of water allocation and agricultural efficiency to improve water security. As well as challenges relating to socio and economic factors, including risks of change born by water users, two other major challenges exist.

a) Divergent view of future potential and policy priorities – different stakeholders have divergent views of prioritizing policies (water and agriculture) and how they are implemented. This results in conflicting and possibly contradictory policy goals and information hindering sustained and supported progress and adjustment in water and agricultural policies. These include a dichotomy between increased food security based on domestic production, and shifts to higher value uses of water in agriculture, and the role of treated wastewater in providing for reallocation of freshwater resources.

b) Challenges of policy coordination include overlap and gaps in policy and legal structures, not only in water and agriculture but also energy, economic and social policy. These coordination challenges hinder dissemination of information, lead to inefficiency in the use of scientific knowledge, and create silos in the delivery policy across the multiple relevant sectors. Gaps in coordination have also been found to provide avenues to circumvent laws and regulations in the

¹ Gilmont, E. M., Steve Rayner, Erica Harper, Lara Nassar, Nadav Tal, Mike Simpson, and Hilmi Salem. "Decoupling national water needs for national water supplies: insights and potential for countries in the Jordan Basin." (2017)

² Gilmont, Michael. "Decoupling dependence on natural water: Reflexivity in the regulation and allocation of water in Israel." *Water Policy* 16, no. 1 (2014): 79-101.

³ Gilmont, Michael. "Analysing the economic development impact of semi-arid lands, and mitigation by food-trade water resource decoupling." (2016).

⁴ Nassar, Lara. "a Guidance note for SDG implementation in Jordan: water, energy, and climate change". 2017

agriculture and water sectors. Previous research has found some actors identifying a strong need for improved cross-ministerial engagement and coordination.⁵

This report examines these elements (a and b) through review of key areas of policy and commentary around water and agriculture. Identifying four themes where these two challenges exist, our research further explored the issues among two key actor groups within water and agriculture, namely farmers (representing the largest water users, and those under greatest pressure in face of growing non-agricultural water use), and the policy stakeholders and donors involved in water and agriculture.

The report starts with a brief review of key policy, laws and bylaws and other literature around the current focus on water and agricultural policy in Jordan, around four key themes; agricultural water productivity, use of treated wastewater in agriculture, cross ministerial coordination and dialogue, and trade-offs across water-food-energy nexus and associated policy priorities.

The report examines farmer perspectives around the four themes in a focus group discussion setting, highlighting the range of ideas and priorities that exist from farmers in both the Jordan Valley and the Highlands. The report presents the results from a roundtable discussion with policy stakeholders, also grouped around similar themes. The range of results within and between both groups were mapped across policy and wider ideational space. We concluded with suggestions for further applied research and action around water and agricultural policy in Jordan.

3 Findings

3.1 Literature Review

Key policies, legal documents (laws, bylaws and strategies) and literature relating to water and agriculture were reviewed, and grouped according to the four themes: agricultural water productivity, use of treated wastewater in agriculture, cross ministerial coordination and dialogue, and trade-offs across water-food-energy nexus and associated policy priorities.

3.1.1 Agricultural Water Productivity

Both the Ministry of Agriculture (MoA) and the Ministry of Water and Irrigation (MWI) include policy commitments to improve water productivity. The mechanisms by which this is achieved, and the metrics used, differ between each policy area. MWI focuses on “optimising agricultural water productivity through water pricing”, how pricing can help incentivise update of new agriculture, or account for farmers adjusting to new agricultural practices to improve water productivity.⁶ The policy document from the Ministry of Agriculture, produced in 2011, focuses on research programmes directing towards the efficient use of irrigation water on drought tolerant crops and species.⁷ Bylaw No. (133) of 2016, relating to the agricultural sector also promote organic agriculture, but without reference to how this contributes to stated water productivity goals.

⁵ Gilmont, E. M., Steve Rayner, Erica Harper, Lara Nassar, Nadav Tal, Mike Simpson, and Hilmi Salem. "Decoupling national water needs for national water supplies: insights and potential for countries in the Jordan Basin." (2017).

⁶ Ministry of Water and Irrigation. "National water strategies 2016 – 2025", 2016.

⁷ Ministry of Agriculture. "The Agricultural sector in Jordan .. reality & goals". 2011.

Additionally, the latest document by the Ministry of Agriculture law No. (13) of 2015 and its amendments, states that the agricultural sector has the full responsibility to manage and develop the sector under specific goals, such as increase food and agricultural productivity, and the sustainable use of agricultural natural resources without causing damage and harm to the environment. While the stated policies and laws are not inherently contradictory, the instruments used are diverse, and there is no mechanism for coordinating the interaction of these policies, for example, the national water strategy 2016- 2025 that was introduced by the Ministry of Water and Irrigation highlighted the priorities of water allocation as municipal, industrial, and touristic purposes of which they present higher social and economic revenues. Meanwhile agriculture consumes 56% of the fresh water and only directly contributes 3% of the Jordanian GDP.⁸

3.1.2 Use of treated Wastewater in agriculture

Both MWI and MoA policies recognise the importance of treated wastewater in meeting future agricultural water needs. MWI (2016) highlights that wastewater reuse is below potential in terms of percentages of wastewater produced that could be supplied to agriculture.⁹ The MWI policy is one of substituting freshwater for treated wastewater, as well as any increase in agricultural water allocation being met solely through treated wastewater provision.¹⁰ As of 2016, 140 mcm/year of treated wastewater was supplied to agriculture, with projections for this to grow to 235 mcm/year by 2025.¹¹ Assuming total agricultural supplies remain relatively static at around 500mcm/year, based on MWI (2016) plans for Treated Wastewater production and agricultural water allocations; 47% of agricultural water supply (235mcm/year) will be made up by treated wastewater, used either directly or blended with freshwater by 2025.¹² The success of such a high degree of substitution of fresh for treated water will, however, be dependent on the agricultural sector to use that water, itself dependent in part on the quality of the treated or blended water and the quality needs of current and future agricultural applications and soil conditions.

The MoA 2011 states that treated water is to be limited to fodder and tree crops only¹³, and the agriculture law No. (13) 2015 added that this water should be used only with specific instructions from the Ministry due to health concerns over the use of water in the human food chain. Such limits on the use of wastewater call into question how such large volumes of water could be assimilated by the agricultural sector. The MWI themselves highlight the importance of soil sustainability and degradation due to irrigation practices in their 2016 policy¹⁴. Shatawni (2007) has highlighted the drainage and salinity challenges of treated wastewater in agriculture, especially in use of lower quality wastewater¹⁵. The MWI vision on treated wastewater therefore appears to present challenges when viewed with its own goals on soil sustainability, and the Ministry of Agriculture's limit on the use of treated water. Less policy clarity in any documents reviewed are

⁸ Ministry of water and Irrigation. "Water budget", 2018.

⁹ Ministry of Water and Irrigation. "Decentralized wastewater management policy". 2016.

¹⁰ Ministry of Water and Irrigation. "Water reallocation policy". 2016.

¹¹ Ibid.

¹² Ministry of Water and Irrigation. "National water strategies 2016 – 2025", 2016.

¹³ Ministry of Agriculture. "The Agricultural sector in Jordan .. reality & goals". 2011.

¹⁴ Ministry of Water and Irrigation. "Water Substitution and Reuse Policy". 2016.

¹⁵ Shatanawi, M., M. Duqqah, and S. Naber. "Agriculture and irrigation water policies toward improved water conservation in Jordan." CIHEAM (2007): 97.

around the use of blended wastewater, and the limits of application and soil health. This will be discussed further in the farmers and policymakers' sections of this report, including challenges of variation in blended water quality.

3.1.3 Cross ministerial coordination and dialogue

Both MWI and MoA recognise the need for improved dialogue in policy and implementation, however the MWI is much stronger on its vision for inter-ministerial coordination. Under its plans for Integrated Water Resources Management (IWRM) it highlights the need for coordination with the Ministries of Agriculture, Finance, Environment, and Planning and International Cooperation.¹⁶ The MWI also identifies the need to coordinate plans for economic efficiency, social equity and environmental sustainability across relevant ministries, and proposes “building a national policy dialogue and forum to build awareness and consensus among all stakeholders”.¹⁷ The MoA's 2011 policy also supports dialogue, but not to the same holistic extent as promoted by MWI.¹⁸ The policy refers to involving farmer organisations in water planning and management in the Jordan Valley, but does not extend to deeper inter-ministerial cooperation.¹⁹ Furthermore, other analysis (RVO, 2016) draws attention to agricultural policy as supporting traditional livestock and export horticulture, which might result in lower potential water productivity (especially in livestock), and may not providing avenues for social and economic adaptation in the face of water scarcity.²⁰ Sidahmad et al., (2012) also highlights the strong need for improved coordination between the various institutions directly and indirectly involved in the agricultural sector.²¹

There are further coordination challenges around ministerial commitments to sustainability. The MWI stresses environmental sustainability of water and soil systems relative to pressures of agricultural water use. The MoA's focus is on boarder economic and social sustainability and adjustment of the sector. Arguably the two sets of metrics might contradict, especially where efforts to implement environmentally sustainable practices place economic or socially unsustainable burdens on the agricultural community. There is little attempt within or between the two sets of policy to reconcile these criteria. Shatanawi et al., (2011) criticises the then-current water policy for prioritising groundwater sustainability ahead of agricultural sustainability, and the inherent conflict that arises.²² Sidahmad et al., (2012) point to the role of land fragmentation in reducing efficiency and livelihood sustainability of agriculture, and the lack of policies to address the important contributor of unsustainable trends, driven by factors both internal and external to the agricultural sector.²³

¹⁶ Ministry of Water and Irrigation. “National water strategies 2016 – 2025”, 2016.

¹⁷ Ibid.

¹⁸ Ministry of Agriculture. “The Agricultural sector in Jordan .. reality & goals”. 2011.

¹⁹ Ibid.

²⁰ <http://www.bureauleeters.nl/data/103-wsXTPO1yf418/export-value-chain-fruit-vegetables-jordan-2016.pdf>

²¹ Sidahmed, A., W. Rabboh, S. Khresat, and E. Karablieh. "Pre-identification mission: support to agricultural development in Jordan." Contract 2011/278635 (2012).

²² Shatanawi, Muhammad, and Sawsan Naber. "Valuing water from social, economic and environmental perspective." El Moujabber M.(ed.) (2011): 109-117.

²³ Sidahmed, A., W. Rabboh, S. Khresat, and E. Karablieh. "Pre-identification mission: support to agricultural development in Jordan." Contract 2011/278635 (2012).

Contradiction of national priorities involving two important ministries MWI and MoA are rooted in their national strategies. The Ministry of Water and Irrigation National Strategy (2016-2025), prioritises the importance and ensuring an integrated sustainable management of water in different aspects such as groundwater governance, WASH and sewage, without specific mention of food security. Ministry of Agriculture goals (2011, 2015) indicate efficient use of irrigation water, also other priorities focus on food sovereignty, marketing, food production and exports. Without coordination between these goals, there appears to be an inherent contradiction between sustainable water management on the one hand and the goal of food sovereignty and agricultural exports.

3.1.4 Trade-offs across Water-Food-Energy nexus and associated policy priorities

Agricultural production and water use can be nested within wide policy priorities and challenges for Jordan and the world. In parallel to policy and operational coordination needs discussed above, there are wider prioritisation trade-offs that can be considered. The national water strategy 2016-2025 recognises the importance of the Water-Energy-Food nexus, plus climate change concerns (both emission production and adaptation to change), and stresses trade-offs required between these factors. For example, increased agricultural water demand to meet food security aspirations requires both water and energy, while energy production increase emissions. Similarly, climate change trends will likely reduce natural water availability and increase crop water demand and decrease the crop production. These and many other factors demand complex assessment and trade-offs in deciding on policy.

While MWI is highlighting the inter-dependent nature of the nexus, the Ministry of Agriculture is clearly prioritising socioeconomic health of the agricultural sector. Namrouqa (2018) draws attention to restrictions on imports of certain crops including potatoes, onions and citrus, policies to increase domestic cultivation (food security), and improve agricultural economic performance and employment.²⁴ However, such policy may not favour water productivity, energy use and climate resilience. Sidahmad et al., (2012) also highlight how the agricultural incentive system in Jordan encourages inefficient crops when measured by economic returns per cubic meter of water.²⁵

The contrast between MWI and MoA's policies is highlighted in the following two policy statements. MoA's 2011 report clearly states the need to "Increase self-reliance and improve agricultural trade balance, and improved regional development for agricultural development".²⁶ By contrast, MWI focuses on "more realistic and sustainable regime of water use in agriculture is to be introduced for maximizing economic returns and ensuring optimal use of wastewater".²⁷ While the MWI statement itself does not reflect the demand of nexus-based thinking, the differences between the scope of frames of reference across both ministries is highlighted. The demands of food self-reliance, especially in the area of fodder crops, would also appear to post direct

²⁴ <http://www.jordantimes.com/news/local/action-plan-strengthen-resilience-agriculture-sector>

²⁵ Sidahmed, A., W. Rabboh, S. Khresat, and E. Karablieh. "Pre-identification mission: support to agricultural development in Jordan." Contract 2011/278635 (2012).

²⁶ Ministry of Agriculture. "The Agricultural sector in Jordan .. reality & goals". 2011.

²⁷ Ministry of Water and Irrigation. "National water strategies 2016 – 2025", 2016.

contradictory challenges to water security. The risks and trade-offs of each side of this policy dilemma are not discussed or addressed by either set of policies.

The next two sections will review the four themes from the perspective of farmers and policy practitioners, gaining their insights into challenges, needs and ways forward around each theme.

3.2 Farmer review - focus group meetings:

Three focus group discussions were held with farmers, two were conducted in Jordan Valley and one in the highlands. Each focus group consisted of 10-12 persons. The discussion covered the four themes, several points were raised and discussed as below:

3.2.1 Agricultural water productivity

Farmers at the Jordan Valley and Mafraq governorate (Highlands) found the term agricultural water productivity in general quite vague. They provided different perspectives on how agricultural water productivity reflects on their work as farmers. The term was associated with how the saved water from using crops that require less water consumption can be utilised for greater agricultural expansion, their willingness to adopt new crops such as drought tolerant crops or organic farming, and new agricultural and water innovative technologies.

Farmers are aware of the new technologies in the agriculture sector and they are willing to learn more but according to them, adoption of new technologies and cropping patterns will require market insurance, consumer acceptability and financial support.

3.2.2 Using of treated Wastewater in agriculture

Based on the National Water Strategy 2016 – 2025, Jordan has one of the highest coverage rates in the region and almost 91% of treated wastewater reused in agriculture. The national water reallocation policy, prioritises the need to cap and replace fresh water allocated for irrigation in the highland to treated wastewater. Also, in the Jordan Valley irrigated agriculture percentage will increase with increasing the usage of treated wastewater as a resource.

Principally, the experience of farmers with regard to using treated wastewater has not been positive. Farmers identified several negative implications for using treated wastewater in agriculture; disturbance in soil quality and decrease in agricultural production such as in citrus trees. This has directly reflected on their export potentials as export production should meet specific international criteria.

Moreover, farmers identified a pressing need for the provision of better and reliable information to them to assist using treated wastewater for the appropriate crops. Farmers highlighted that the Ministry of Agriculture through the role of extension services should provide monthly brochures and leaflets of treated wastewater quality and quantity to inform farmers about the standards of the water used and for what exact crops it can be utilised. Such services were historically provided during initial introduction of treated wastewater, but the dissemination of information by the authorities has been discontinued.

3.2.3 Cross ministerial coordination and dialogue

The disparity in efforts from different related ministries (Ministry of Water and Irrigation including Water Authority of Jordan and Jordan Valley Authority, Ministry of Agriculture, Ministry of Trade and Ministry of Industry) in the agricultural field was noticed by farmers. The agricultural sector is seen to lack coordination, integration and communication between three streams, intra-ministerial (between departments at the same ministry), inter-ministerial coordination (between different ministries) and between ministries and farmers. Farmers suggested that efforts should be focused on enhancing the role of each Ministry and specifically the Ministry of Agriculture, in improving operational and policy communication for the agricultural sector. For example, farmers expressed the opinion that the Ministry of Agriculture should be responsible for conducting rigorous studies of external and local fruit and vegetable markets, in order to identify market needs and priorities. Through working on a coordinated unified cultivation calendar accounting for the needs of the local and external markets across all cultivated zones in Jordan, better regulation of supply could be achieved, avoiding oversaturation of local markets with particular fresh products, and the low return or even waste that frequently results.

An important step in creating better information flow between ministries and farmers as well as improve farmers' knowledge of policies, laws and strategies, lies in the role of the agricultural extension services center. In recent years, farmers felt a significant decrease of activity from the extension services center in providing the appropriate human resources of specialised staff and experts, quality of information and conduct periodic meetings with farmers. They describe the current work of extension services as "monitoring while it should be mentoring instead".

Therefore, to maximize the number of farmers benefitting from the services provided by the agriculture extension services center, farmers' union and farmer associations are in place to facilitate access and dissemination of information. Farmers union also still faces constraints with regard to membership policy; only farm owner can join the union while the agriculture sector has a great percentage of farm managers (but not owners) who oversee and control the agriculture practices inside the farm. Such farm manager therefore do not have full access to information and input into policy dialogue that is required to effect appropriate change.

3.2.4 Trade-offs across Water–Food–Energy nexus and associated policy priorities

Border closure that hindered exports, market saturation with specific types of agriculture produce, and weak marketing support, are all consequences of weak complementary policies across different sectors. Institutional challenges require significant attention to overcome the ineffectiveness of the different sectorial policies and their interactions as far as they impact farmers. Different priorities in each ministry hinder those ministries from identifying and understanding the bigger strategic objective. As a result, farmers witnessed significant delays in getting legal approvals in the agricultural sector, impeded due the dispersion of interdependent duties and responsibilities and also contradictions between ministries and authorities. These factors are combined with the delay in implementation of regulations and guidance and advice to farmers.

Hence, to improve coherence of the agricultural regime, higher central national guidance on state level laws will be required to legislate the agriculture sector in which coordination and complementary policies become part and parcel of each ministry's actions.

3.3 Policy Stakeholders Roundtable Findings

A range of policy stakeholders from different ministries, donors, non-governmental organizations and research centers attended a roundtable meeting, to discuss the four themes, and reflect on summaries of farmer-perspective, and offer their own insights into challenges and solutions. Due to the nature of the roundtable discussion, the third and fourth themes were combined.

3.3.1 Agricultural Water Productivity

Roundtable participants critiqued a number of areas of interpretation of policy and policy direction, as well as offered clarification and justification on particular policy areas.

The MWI roundtable participants explained that the focus on water pricing as a tool for improved water productivity was limited by the fact that it has no jurisdiction or influence on regulating water on-farm or otherwise influencing on-farm behaviour and technology update. It was also noted that pricing was not just about tariffs, but the whole valuation system of water as a means of incentivising improved water productivity.

One of the major challenges facing water productivity was grounded in ambiguity over how water productivity, or goals and targets for improved productivity, are defined both within and across ministries. Conflicting definitions, echoing differences within and between water and agricultural policies including economic returns per unit water versus crop production per unit water. The idea of optimising water productivity was also raised and critiqued by policies across spanning water and agriculture, due to the complexity and compounding number of variables that impact productivity outcomes, including water quality, soil, and rainfall, all of which individually and in combination, cause temporal and spatial, and often unpredictable variations in productivity.

Weaknesses in marketing and coordination of production and marketing of products in agriculture were raised as major impediment to improved productivity in terms of improved use of water, especially with regards to planning and investment by farmers. Changes to international trade, due to regional security fluxes, were seen as contributing to waste and overproduction, and disincentivising investments by farmers without a secured market for their crops. Part of the marketing challenges relate to communication of timely information to farmers on market needs. Communication was also noted as a weakness with regards to the dissemination of information on monitoring of water productivity, and dissemination of information on improved water productivity.

Others in the policy community highlighted that certain areas of the agricultural sector, especially in the Jordan Valley are highly productive. They generate crop production with up to 50% less water than is theoretically required in that area. This argument related to a concern that laws, regulations and targets were not properly tailored to the potential and needs of different agricultural areas and basins. Placing blanket aspirations and goals across the agricultural sector

was not seen to be enabling policy attention and resources to be targeted and tailored to specific needs and geographical and sub-sector areas of greatest potential for improvements in water productivity.

While there is commitment to improved productivity, there is a need to improve definitions and goals, and better understand the factors impeding the defined productivity within water and agricultural sectors, and tailor policy to meet specific regional needs and potential. These issues are further raised in the discussion of policy coordination.

3.3.2 Use of Treated Wastewater in Agriculture

There is considerable concern by the agricultural policy interests of how Treated Wastewater (TWW) is used. Improved rainwater harvesting is advocated as an alternative to wastewater to meet agricultural growth needs. Part of the opposition to use of TWW is a real concern regarding the impact on crop quality and also the health of consumers. Roundtable participants pointed to previous studies that have demonstrated contamination of the food chain by wastewater use,²⁸ while previous health outbreaks domestically and internationally linked to Jordanian crops have harmed the export sector and led to national media (online outlets) opposition of treated wastewater use in food crops.

There was an argument that in general, TWW blended with freshwater presents no major problem to crop and food quality. However, concerns were expressed that variations in quality of blended water was not properly being communicated to farmers. The monitoring data exists, but the enabling system was absent for that data to be transferred and used to minimise risk and maximise water productivity. This issue was raised both the scientific authorities, the agricultural and water policy sectors, and reflects the stated concerns of farmers, discussed above. A lack of appropriate legislation and delineation of responsibilities was highlighted as perpetuating these communication weaknesses. Participants also raised the possibility of reducing variation in blended water quality through separation of flood runoff from blended water, enabling controlled mixing of TWW with fresh water.

As with water productivity challenges discussed above, the need for disaggregated policies in different environmental and agricultural regions was raised. This was especially the case for the relevance of TWW in the highlands, both in terms of the difficulty of providing that resource in absence of large urban populations, and the suitability in terms of soil and aquifer conditions.

3.3.3 Cross ministerial dialogue and Nexus trade-offs

There was overall agreement about the need for improved coordination of strategies between ministries. Different stakeholders gave different areas as being priorities for coordination and

²⁸ Carr, Gemma, Robert B. Potter, and Stephen Nortcliff. "Water reuse for irrigation in Jordan: Perceptions of water quality among farmers." *Agricultural Water Management* 98, no. 5 (2011): 847-854.

²⁹ Khalid, Sana, Muhammad Shahid, Irshad Bibi, Tania Sarwar, Ali Shah, and Nabeel Niazi. "A review of environmental contamination and health risk assessment of wastewater use for crop irrigation with a focus on low and high-income countries." *International journal of environmental research and public health* 15, no. 5 (2018): 895.

coordination mechanisms. The MWI perceived general synergies in core policies, but key challenges in how policies were implemented as programmes.

Weakness in implementation was linked to weaknesses in financial, political and human resources. In particular, the donor community was thought to have been historically weak in agriculture support, albeit with renewed interest in recent years. Investment in market and market knowledge were seen as being crucial to help resilience and adaptive capacity in the agricultural sector. The capacity of staff working within the Ministry of Agriculture and associated bodies was also criticised, with lack of resources available to train, recruit and retain the best staff to cover the breadth of knowledge and specialisation required. Private sector and overseas employment opportunities have also acted to pull highly capable staff away from government service in agriculture. Limited 3-year budget and planning cycles and ministerial and senior staff turnover was also highlighted as being a severe limitation to sustained policy and pathways to coordination for implementation.

Coordination and complementarity in programmes in part depends on knowledge and data. Ministries were critical of their ability to access central government data necessary to inform and guide work and to understand the wider sector. One participant highlighted the paradox of having to pay for some data, negating the strength of the Department of Statistics in collating and centralising data across government departments.

Stakeholders from both research and the international community highlighted the absence of high-level priorities to help guide ministerial policies and implementation. Representatives from both water and agriculture identified a demand for improved dialogue and coordination, with donor suggestion of inter-ministerial dialogue working groups and staff exchanges. It was also suggested that a joint committee could be initiated from the highest levels of government to lead efforts on coordination of goals and policy implementation. There was general agreement, and no voiced dissent, across roundtable participants that such an instrument for engagement and exchange could greatly enhance policy formulation and outcomes and programme and investment effectiveness.

Without mechanisms for improved coordination and dialogue, engagement with water, food, energy and climate on a national strategic scale would be difficult. Some limited crossover between water and energy is occurring. The department of energy is working on reducing energy price for farmers, to help alleviate their significant economic pressures. Meanwhile the extension service is working on energy-efficient drip-irrigation systems that will eventually help mitigate agricultural energy demand. Still, there is no umbrella for coordinated actions, approaches and trade-offs across sectors.

4 Conclusion: key findings and next steps

- There is a lack of clarity over the definition, goals and mechanisms of water productivity, experienced both by farmers and the policy community. The mechanisms for improved productivity are siloed between ministries, and programmes are not always complementary and compatible with those of other ministries.

- Treated Wastewater is an area of concern for the agricultural sector, especially with regards to quality and health impacts, as well as the suitability of its use. Improved information and planning on how this resource is used is required, along with information and guidance on its use by farmers. This appears crucial if the water sector's goal of increased TWW use can be achieved, and be realised as a tool to improve cross-sectoral water security in Jordan.
- Unified priorities should be defined by all stakeholders in the agricultural system to sustain the sector.
- There is a strong need for improvement in the role of the agricultural extension services making them the first reference for the sector and converting their work from monitoring to mentoring.
- There is a strong need for improved coordination in areas of policy and policy programming between ministries. The lack of coordination is negatively felt by farmers. Policy stakeholders themselves recognise this need and have proven willing and able, in the context of the roundtable meeting carried out during this research, to have productive engagement over mechanisms for coordination. Improved strategic interrelationships on water, food, energy and climate appear to be dependent on this more fundamental policy and operational coordination and thinking. Given that the roundtable data indicated there is wide-ranging agreement on need for improved coordination, there is a strong window of opportunity to bring parties together to explore and deliver mechanisms for such coordination.

The future of the agriculture sector in Jordan presents immediate and crucial need for appropriate laws to regulate the intersectoral actions in the field. As Jordan has faced uncertainties and the influx of refugees from around the region, combined with growing water scarcity, strategic future planning took low priority, despite the need for the agricultural sector to adapt.

The institutional regime of the agriculture and water sectors requires actions on several levels to better allow for integration and coherence which are mainly due to overlap of policies. Farmers drew specific attention to institutional and technical reforms in the agricultural sector, from the institutional perspective they emphasised the need for a proper water allocation between the different sectors, and future planning that presents a contingency plan to address the sector emergencies such as frost incidents. Technically, farmers also viewed the country's water scarcity through the issue of transboundary watercourses such as the Jordan river basin, of which different political and social wills are necessary both across basin states and within national management institutions, and new management techniques are essential for example in how water resources from sudden large rainfall events can be harvested for use in irrigation.

The sustainability of the sectors entail coordination mechanisms based on a reliable database of water and agricultural knowledge that is also accessible and available for farmers. Most farmers based their agriculture expertise on intergenerational knowledge not technical calculations and models, therefore additional support is needed to fill this gap from the Ministry and extension services center.

This project highlighted some of the key institutional political economic challenges facing the water, agriculture and allied sectors. It presented stakeholder-based evidence for the need for

significantly improved dialogue and coordination within and between ministries to tackle pressing needs in the sectors and work to mitigate blockages and inconsistencies between different policy goals also implementation programmes.

Further work is required to carry out a more thorough, systematic and wide-ranging review of the policy and legislative landscape, to identify and inform any fundamental legal and institutional changes that might be required. However, in parallel there is also a demonstrable window of opportunity to bring policy and other stakeholders together to explore mechanisms for improved coordination and examining how such coordination might shape and improve policy and outcome. Convening stakeholders through a neutral body, with appropriate external international technical assistance, as has been demonstrated in this project, could be an effective and timely way to capitalise on a willingness to engage and resolve some of the major institutional challenges threatening Jordan's water security and agricultural sustainability.



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