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# Water Stewardship in Agriculture

Water crises around the world are shining a spotlight on agriculture. Feeding the current and future billions while ensuring water and land resources are properly protected, and energy supplies are maintained is the great resource management challenge of the 21st century. There is today both a dramatic rise in the recognition of water risk issues by corporate actors[1,2] and a parallel emergence in agricultural investment opportunities driven by demand from national governments and international donors for economic growth.

**COMPANIES ARE MISGUIDED IF THEY THINK RISK EXPOSURE CAN BE DEALT WITH BY SIMPLY REDUCING WATER FOOTPRINT.**

There is a need to better understand how this agricultural challenge will align or conflict with private sector investment and supply chain interventions, and what opportunities there are to improve water resource management. As water stewardship matures and moves from theory and high level discussion to a broader, widespread practice, there's a need to ensure that water risk response and investments from the private sector in agriculture are appropriate, desirable and beneficial to more than just the bottom-line of a single sector.

In this paper we look at some of **the potential risks and unintended consequences of private sector interventions in agricultural water management** and **begin to outline an improved approach to water stewardship.** This short primer is intended to outline some key concepts and stimulate ideas. WWF and IUCN will continue to develop more in-depth analysis. We encourage others to contact us, join this work and share examples and experience.

# BUSINESS PRACTICE IN THE FACE OF WATER RISK

Faced with exposure to water risk, an increasing number of businesses are motivated to respond. Intervening at a field scale in agricultural supply chains is an attractive option for businesses because tangible and measurable outcomes can be delivered, or at least claimed, quickly. These projects often include, for example, rainwater harvesting, promotion of infiltration through field bunds, check dams or percolation tanks, improved irrigation and water – use efficiency with elements of drip or micro-irrigation, or changes to crop management practices, on-site water treatment or wetland filtration. The field-level outcomes from these approaches, measured as local increases in groundwater levels or reduced application of water for irrigation, are relatively easy to demonstrate and quantify. However, while some of these interventions do have larger benefits, a wider system or basin perspective often reveals unintended consequences, failure to "bank" savings where intended or detrimental outcomes for others.

Irrigation canal, Morocco.

# WATER RISK IN AGRICULTURAL SUPPLY CHAINS: THE MYTH OF EFFICIENCY SOLUTIONS

There are numerous water risks for companies involved in agricultural commodity production and consumption, including from issues around water quality and the allocation of scarce water supplies to regulatory compliance and future climate impacts. Significant strides have been made in helping companies understand these water risks. There are now multiple tools available that can help companies and investors map and assess, albeit at coarse levels, water related risks to their operations. Yet while water risk assessments are increasingly common, in practice, we frequently see companies misguidedly responding as if their risk exposure could be dealt with by simply reducing their water footprint with efficiency solutions. The default response has been to drive efficiency first without any real knowledge of the hydro-economic system from which they are drawing water. Most corporate targets and even certification schemes have this efficiency bias. Both standards and corporate targets need to shift to include contributions to basin outcomes. For businesses, it is critical to understand how their responses actually affect risk – be it mitigation, transference of risk to someone/somewhere else, or in fact increasing risk and reducing resilience.

# ARE WATER SAVINGS REAL OR NOT?

Traditional gravity irrigation schemes are generally considered to have field application efficiencies between 30 to 40 per cent; that is, only around a third of the water applied is actually used by the crop in the field. While this efficiency calculation can be true at the field scale (although this has rarely been measured accurately over a whole season), this narrow focus on efficiency may lead to confusion, with the belief that the remaining two-thirds of water is “lost.” The assumption therefore is that improved farm practices can “save” this water for other purposes, usually for more production, without any negative consequences for others.

Most people assume that any water saved returns to the source from which it came, but this is very rarely the case. The reality is that aside from evaporation, the lost water from irrigated fields contributes to surface runoff and return flows that can be used further downstream, through-flow into the shallower soil profile that supports river base-flows, or percolates back down to deeper-level groundwater storage.

A wider perspective that considers the effect of this water reuse at all scales, from irrigation scheme to catchment or basin scale, can in fact demonstrate very high rates of water consumption[3]. When the lost water is not used by agriculture, it often contributes to local livelihoods, provides ecosystem benefits, and contributes to environmental flows.

Similarly, techniques such as rainwater harvesting that increase drainage to groundwater may not necessarily represent real water savings verifiable over a large area and over a hydrological cycle. While the assumption is that non-captured runoff is simply lost to the ocean, the reality is that the captured runoff may otherwise have supported downstream user demands or ecosystems services such as fisheries. Therefore the net effect of these types of water saving techniques is simply to shift local water availability around in time and space, in many cases from downstream users to upstream users.

**To avoid negative consequences from projects intended to save water, producers must move beyond local measurement toward broader evaluation that incorporates community and basin impacts as the unit of scale in water management.**

# WATER SAVINGS OFTEN LEADS TO INCREASED WATER CONSUMPTION

Moreover, under certain circumstances, interventions to save water at the field or farm scale have been shown to result in an overall increase in local water consumption. Firstly, under a given set of conditions, the amount of water used for crop growth increases with biomass. Investments in irrigation efficiency and on-farm water management will usually increase crop yield/biomass, which may directly increase net water consumption.

Secondly, reductions in water used per unit of crop produced through efficiency measures may result in actions that utilize the water saved. Where water previously limited crop production[4] farmers will, rationally due to greater profitability, increase either irrigated areas or the number of crops grown per year, or switch to a more profitable but water-demanding crop (oilseeds to bananas, for example). This intensification effect has been reported widely[5, 7, 8, 9] and actually results in increased local water consumption, reducing flows to downstream users.

In a push for "more crop per drop," we may actually be inadvertently increasing freshwater consumption, not reducing it. From a water risk perspective, increasing biomass and yield may be good for farmers and those interested in greater yields in the short term, but it may not mitigate water risk and may indeed increase reputational risk. In many cases this may transfer physical water risk downstream and reputational water risk upstream, rather than successfully mitigating it. The flow of benefits upstream and downstream has long been a challenge for integrated water resource management. At the basin scale it remains unclear how agriculture has responded to the challenge of sustainably growing more with less water, in large part due to weak monitoring mechanisms of both groundwater and surface flows.

Local interventions to improve productivity and increase availability or reliability of water supplies do provide important localized livelihood benefits. But we must recognize that these benefits can come at the expense of downstream users, and may have a negative effect on the livelihoods of other water users and the ecosystems they rely upon. Often, project outcomes and key performance indicators only report on localized water savings through metrics such as the reduction in applied irrigation water, the increase in water retention or productivity increases. These rarely recognize or report on the disadvantages that emerge when projects are assessed as a water balance at wider scales. Water management agencies and regulators have yet to systematically respond to these basin-scale challenges.

To avoid any potential negative consequences from projects intended to save water, producers must move beyond local measurement toward broader evaluation that incorporates community and basin impacts as the unit of scale in water management. Evaluations should be based on overall water balances or water accounting that distinguish between consumptive and non-consumptive uses – those that deplete water supplies at the basin scale and those that do not – and explicitly recognize the different hydrological pathways (such as recharge of groundwater from excess irrigation applications). Evaluations should also consider the optimal use of scarce water resources to maximize human well-being, explicitly considering trade-offs between the use of water for energy, food, drinking water or biodiversity needs.

# A WATER STEWARDSHIP APPROACH

As more river basins face closure from over-allocation of water resources, there is an opportunity to support basin-level approaches and to better understand water management choices and their implications. For business, a broader question is what interventions can deliver the changes to catchment water management necessary to address their water concerns. To address the physical risk of water availability, it may be possible in some cases to make local changes to enhance hydrology to meet operational water requirements. In many instances, however, multiple water users are drawing on the same water resources and it is not possible to exclude other users from access to water saved by any single facility or intervention. Furthermore, this still does not address the potential reputational or regulatory risks generated when interventions inadvertently increase consumptive use and reduce downstream flows.

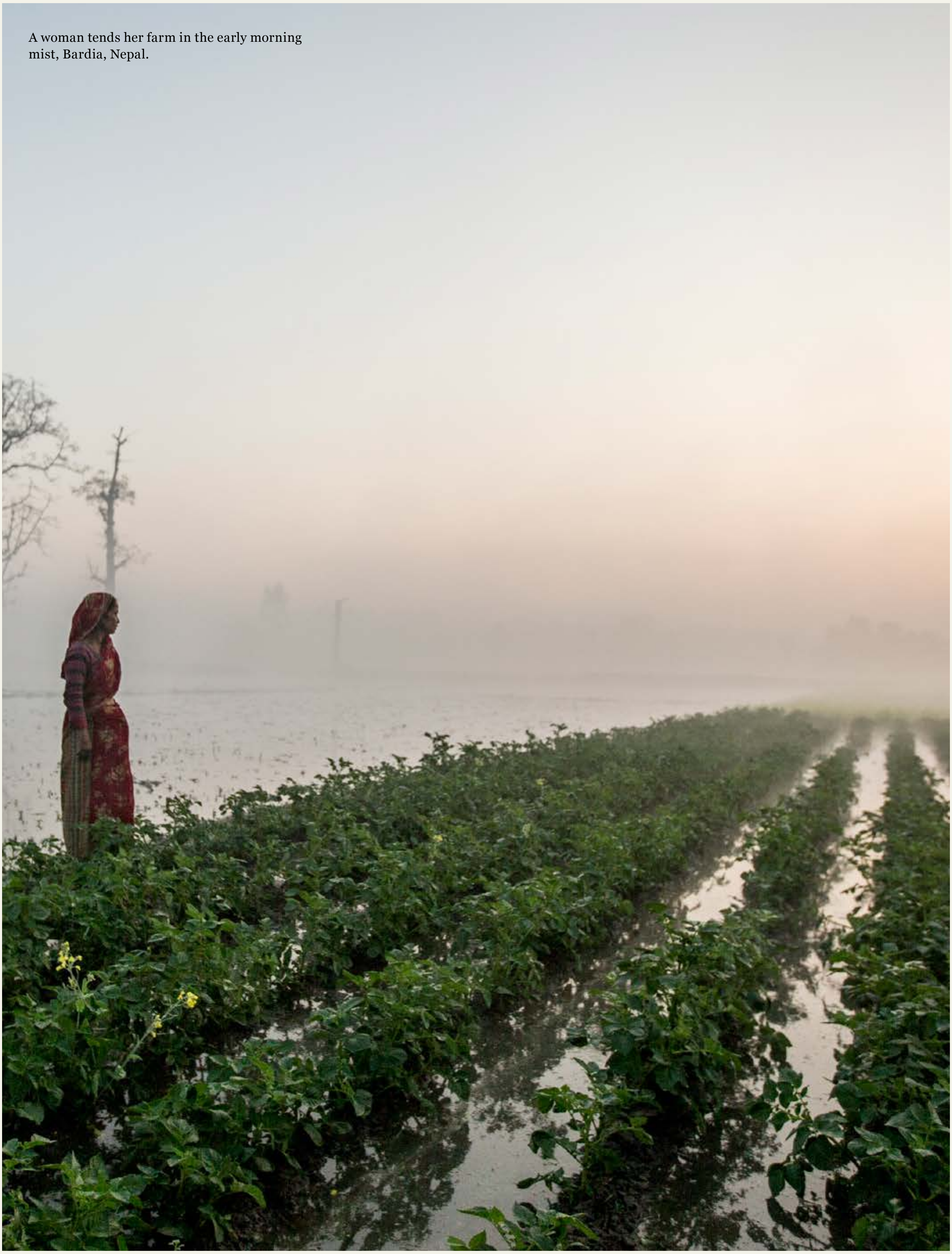
In most cases it is unlikely that isolated field-level interventions by individual businesses can be achieved at the necessary scale or with sufficient continuity to meaningfully influence water flows. Supply chain risks cannot fully be addressed by solely looking at farm-level water management. Scaling-up requires collective action with other water users and engagement with water governance institutions to achieve optimized, sustainable allocations of water and maintenance of environmental flows and ecosystem services[10].

To address fundamental water risks, direct business interventions in agricultural water management need to be part of a broader strategy to strengthen water governance and improve river basin planning. Interventions must explicitly recognize other actors working within catchments, and genuinely and materially address shared water issues that drive corporate water risks. This requires speaking with, learning from and collaborating with water management agencies and regulatory authorities who have to manage water at multiple scales. It should also prompt a review of what crops are grown and for what purpose, as well as alternative uses of water – for energy, ecosystem services or drinking water security. Collective action must ensure that water users jointly determine optimal water resource use, rather than allowing powerful commercial interests to dominate water management. Bottom-up collective action should help bring coherence to a currently scattered set of small-scale interventions and match these to large-scale infrastructure and systems where relevant.

While field-level interventions may be insufficient to truly mitigate a full-range of water-related business risk, more comprehensive and robust monitoring is needed to understand whether they create real water savings or affect catchment hydrology. If the evidence shows positive impacts, beneficial projects can be scaled up by those with a governance mandate for water management.

In summary, businesses engaging in water-saving projects as part of water stewardship programmes must approach water management as a complex social, political and technical problem. Simplistic and isolated field-based solutions rarely work when disconnected from river basin hydrological and political realities.

Irrigated soybean field, Goiás, Brazil.



A woman tends her farm in the early morning mist, Bardia, Nepal.

# CONCLUSIONS

As the discipline of water stewardship matures and moves from high level discussion and concepts to business action, there is a parallel mobilization of practitioners and academics providing robust scrutiny of both the intended and unintended outcomes[11,12]. It is critical, therefore, that businesses engaged in water stewardship fully understand the hydrological, socio-political consequences of their water management interventions. A failure to appreciate these complexities can lead to overly-simplistic, supply-side, techno-centric solutions that will not mitigate risks, nor deliver sustainable water management at the basin scale.

Some key considerations for businesses engaging in agricultural water management are:

1. **Improve site-level transparency of water information:** The lack of transparency and data impedes verifying if real water savings has occurred.
2. **Improve availability of basin-level water stocks and flows:** Information on surface and groundwater levels and fluxes is critical to creating effective solutions.
3. **Focus on shared water challenges, not efficiency solutions:** Companies must understand whether interventions effectively address water challenges and reduce water risk, or simply transfer the challenges and risks to others downstream.
4. **Understand the scales of hydrology, from local to catchment or basin:** Failing to understand how water flows through a system can undermine the effectiveness of the intervention.
5. **Understand water's role in the economy:** Evaluate trade-offs between the use of water for food, energy, ecosystems or greater water security.
6. **Be clear on definitions:** In particular, pay attention to how terms such as "water efficiency," "water productivity," and "saved water" are used.
7. **Understand allocations:** Relate your water management activities to the basin and ask yourself how you are supporting water management in policy and in practice.
8. **Seek solutions at the field and policy level in parallel:** Only undertake field-scale interventions in water management if there is a parallel process of policy engagement to implement an effective framework of water allocations.
9. **Understand there is intense competition for "saved" resources; don't think you are banking them for your exclusive future use [13].** Initiate a dialogue with parties interested in these savings.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# Freshwater facts

## 80%

Nearly 80 per cent of the world's population is facing threats to water security

## 64%

More than 64 per cent of the world's wetlands have been lost in the 20th century

## -76%

The Freshwater Living Planet Index, which measures trends in vertebrate species populations, shows a decline of 76 per cent between 1970 and 2010

## OVER 20%

Hydropower produces more than one-fifth of the world's electricity

**Why we are here**
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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The mission of the IUCN Global Water Programme is to be a trusted partner for evidence-based and adaptive change in water resource management that benefits nature and people



**For more information, please contact:**
Stuart Orr, sorr@wwfint.org
James Dalton, james.dalton@iucn.org