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Impact Investment and Saline Agriculture

Policy Brief

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Summary

Soil and water salinisation are a growing challenge worldwide due to climate change and poor management of agricultural lands. The aim of this policy brief is to shed light on the impact investment opportunities in relation to saline agriculture. Based on an expert workshop conducted at the SALAD-SUSTAIN conference 2024 in Brussels, we present the key messages from the emerging debate. We supplement these findings with the examples of successful implementation of saline agriculture pilots in Kenya, Bangladesh, Pakistan, Egypt and Morocco . Based on these insights, we propose a number of recommendations which are the following: future saline agriculture in this region:

- **Agriculture as a Climate-Smart Practice**: Policymakers should formally include saline agriculture under the broader umbrella of climate-smart agriculture to facilitate targeted funding and policy support.
- **Bridge the Funding Gap**: Inter-national development banks and climate funds should develop hybrid financing models that combine grants and concessionary returns to better support small- and medium-scale saline agriculture projects.
- **Promote Pilot Projects**: National governments and international institutions should prioritise funding for at least 100 saline agriculture pilot projects (appr. two per country) by 2030 to measure their impact.
- **Enhance Government Support**: Governments should establish clear regulatory frameworks, including stable land rights and irrigation subsidies to mitigate political and production risks related to the industrialisation of agriculture and water management.
- **Encourage International Cooper-ation**: Strengthening international cooperation through exchange programs and shared learning platforms will help address technical, financial, and market-related challenges in scaling saline agriculture globally

Samenvatting

De verzilting van bodem en water vormt wereldwijd een groeiende uitdaging, deels als gevolg van klimaatverandering en slecht landbeheer. Het doel van deze beleidsbrief is om de investeringsmogelijkheden in zilte landbouw te belichten. Op basis van een workshop met deskundigen, gehouden tijdens de SALAD-SUSTAIN-conferentie 2024 in Brussel, presenteren we de belangrijkste boodschappen die uit de discussies naar voren kwamen. We vullen deze bevindingen aan met voorbeelden van succesvolle pilots voor zoutwater-landbouw in Kenia, Egypte en Bangladesh. Op basis van deze inzichten doen we een aantal aanbevelingen:

- **Zilte landbouw als klimaatslimme praktijk**: Beleidsmakers dienen zilte landbouw formeel op te nemen onder de bredere paraplu van klimaatslimme landbouwpraktijken.
- **Overbrug de financieringskloof**: Internationale ontwikkelingsbanken en klimaatfondsen moeten hybride financieringsmodellen ontwikkelen die subsidies en concessionele rendementen combineren, om kleinschalige en middelgrote zilte land-bouwprojecten beter te ondersteunen.

- **Stimuleren van proefprojecten**: Nationale overheden en internationale instellingen moeten prioriteit geven aan de financiering van ten minste 100 proefprojecten (ongeveer twee per land) voor zilte landbouw tot 2030.
- **Vergroten van overheidssteun**: Regeringen dienen duidelijke regelgevende kaders op te stellen, inclusief stabiele landrechten en irrigatiesubsidies, om politieke en productierisico's te verminderen.
- **Internationale samenwerking bevorderen**: Het versterken van internationale samenwerking door middel van uitwisselingsprogramma's en gezamenlijke leerplatforms zal helpen bij het aanpakken van technische, financiële en markt-gerelateerde uitdagingen bij het opschalen van zilte landbouw wereldwijd.

1 Introduction

Producing food in salt-affected soils presents a significant challenge, often resulting in lower yields compared to those achieved under optimal freshwater conditions (Zörb *et al*., 2019). Unfortunately, the area of salt-affected land worldwide is expanding rapidly due to freshwater scarcity, a problem exacerbated by climate change and rising sea levels (Hassani *et al*. 2020). In response, researchers, farmers, agricultural organisations, and governments are exploring various practices to maintain land productivity. Over the past few years, various initiatives have emerged, including the establishment of field laboratories and pilot plots to develop and test innovative approaches (Smaoui *et al*., 2024; Negacz *et al*., 2022).

Commercially viable farming is possible on low to moderately salt-affected soils by employing a combination of specialised practices: 1) dedicated freshwater management, 2) adjusted soil management, including the application of green fertilisers, and 3) the use of salt-tolerant crop varieties. For the highly saline soils, halophytes, plants that prefer salt-affected soils, can be used to maintain food production.

Scaling up these practices presents a major global challenge. Farming practices are deeply embedded in local and regional social, cultural, consumer, and commercial contexts, making adjustments difficult even when agricultural production declines (Qadir *et al*., 2014). As salinity increases, it often leads to local and regional economic deterioration, eventually resulting in land abandonment (ibid.). This, in turn, places increasing pressure on the remaining arable land and ultimately threatens regional and global food security. Counteracting these developments will require a combination of dedicated international and national policies and significant investments (Vellinga *et al*., 2021).

Consequently, an international **Impact investing and policy workshop** co-organised by SALAD project and SUSTAIN COST Action was held in Brussels on April 16, 2024, to discuss the current efforts of international funding organisations with regard to salinity.

Agenda of the Impact investing and policy workshop, 16 April 2024, Brussels, Belgium

14.00-15.15h *Session 1* moderated by Prof. Cherki Ghoulam – Cadi, Ayyad University, Morocco.

Introduction on the workshop on opportunities for impact investment, Prof. Pier Vellinga VU Amsterdam, The Netherlands.

Keynote: Climate change challenges and opportunities in saline agriculture: examples *of WB-financed projects*, Dr Fatma Rekik The World Bank, USA.

The need for funding, Prof. Farouk El-Aidy Kafrelsheikh University, Egypt.

A review of successful business cases, Dr Bas Bruning The Salt Doctors, The Netherlands.

A framework for the evaluation of investment proposals, Mischa Heer VU Amsterdam, The Netherlands.

15.45-17.00h *Part II*

Keynote: Funding for Adaptation to Climate Change, Keiron Brand Dutch Fund for Climate and Development, African Region, The Netherlands Round table discussion.

Key learnings from the conference and a way forward, Prof. Pier Vellinga VU Amsterdam, The Netherlands.

The main aim of the workshop was to shed light on opportunities and barriers for investors in saline agriculture, review successful business cases and connect development NGOs, impact investors, and government policy makers. Representatives from the Mediterranean and North African regions highlighted the urgent need for funding as the region faces severe droughts due to climate change (Skuras & Psaltopoulos, 2012). International organisations, including International Food Policy Research Institute (IFPRI) and United Nations Food and Agriculture Organisation, emphasised the critical role of financial support for food security. IFPRI noted that transforming salt-affected lands requires "substantial initial investments in soil reclamation, water management infrastructure, and appropriate crop varieties". FAO added that "government subsidies, grants and technical assistance programmes" are crucial to help farmers meet the economic challenges of sustainable agricultural development. Financial institutions presented their initiatives at this event and a private company, the Salt Doctors, showcased successful business studies worldwide.

This policy brief summarises the results of the Impact investing and policy workshop discussion addressing this issue, led by key financial actors such as the World Bank, the European Development Financial Institution, and specialised international climate funding organisations. It further builds on an earlier study by Mischa Heer (2023) of the Vrije Universiteit Amsterdam, which explored funding options for saline agriculture in Morocco as well as discussions held with workshop participants including public, private and civil society actors.

The workshop resulted in a clearer understanding of the current state of the art and produced a series of recommendations for policymakers in agriculture and for international and national impact investment organisations, including development banks and climate funding organisations.

In this policy brief, we present the financial landscape for climate-smart agriculture. Further, we summarise key messages from the SALAD-SUSTAIN impact investing workshop. We continue with outlining business opportunities within saline agriculture. We conclude with recommendations for policy and practice.

2 Financial landscape for climate smart agriculture

Climate change, particularly the increase in droughts, is a significant factor contributing to the expansion of salt-affected land areas (Corwin 2021). International climate conferences and the United Nations Framework Convention highlight the need for and commitment to providing international financial assistance for climate change policies, emission reductions, and adaptation measures (Sands, 1992). In agriculture, the concept of "climate-smart agriculture" has been introduced. Climate-smart agriculture involves adjusting current agricultural practices to reduce greenhouse gas emissions while enhancing the resilience of agricultural production to climate change (Lipper *et al.*, 2014). Saline agriculture aligns well with this dual objective. It maintains arable lands for food and feed production, thereby building new soil carbon and preventing further soil carbon loss. Additionally, saline agriculture helps local and regional agricultural communities

become more resilient to climate change (Bonner, 2024).

International development banks, European Development Finance Institutions (EDFIs), and newly established Climate Funds are the most suitable financial organisations for providing funding for the agricultural use of salt-affected- or degraded lands because of their mission and focus on development and global challenges. These financial institutions can generally be categorised based on their return conditions, such as "market return", "concessionary returns", and "no returns". Additionally, there are hybrid models, known as "blended finance", which mix grant finance (no return) with concessionary or market returns.

3 Key messages from the Impact Investing workshop

The presentations and discussions at the workshop culminated in several shared observations and recommendations which are categorised by each actor group and listed below.

- **Development banks and climate funding organisations** are increasingly **recognising the need for financial support for agriculture in the context of climate change and freshwater scarcity**.
- Many countries such as the Netherlands share cultural heritage and tradition of supporting freshwater agriculture regardless of economic and environmental costs. Progressing climate change questions this traditional approach and asks for both mitigation and adaptation to address growing freshwater scarcity through salinity management techniques. Saline agriculture falls under the umbrella of climate-smart agriculture, although it is not yet explicitly recognised as a distinct theme. This needs to change. Governments, shareholders and policymakers should advocate for a funding approach specifically targeted at salt-affected lands through their development institutions and climate funds.
- **Funding organisations face significant challenges in reaching farmers** and agricultural practitioners at the local and regional levels. There is a mismatch between the scales of funding demand and supply. Programs and projects assisting farmers and farmers' organisations require funding ranging from 0.1 to 1 million euros, while international funding organisations typically operate at scales of 10 to 100 million euros. Development institutions and international NGOs need to develop effective strategies to bridge this gap and better support local transformative agricultural initiatives.
- **Microfinance institutions (MFIs) are better equipped to reach farmers and their organisations**. However, the commonly required return on investment in microfinance schemes is often too high to be commercially attractive for these farmers. Despite this, MFIs are still the most capable of reaching farmers. Therefore, the number and regional representation of MFIs should be increased. National governments and development banks can play a crucial role in this expansion. Additionally, the approach of MFIs should be adjusted to better meet the needs of farmers and their organisations.

- **Stakeholders including key players such as national governments should recognise the problem of soil salinity**, develop comprehensive national policies as part of their climate-smart agriculture policies, and highlight these ambitions in their National Adaptation Plans submitted under the International Climate Change regime (UNFCCC).
- **International development finance organisations and climate funds should develop** dedicated programs to upscale saline agricultural practices. These programmes should combine grants and investments, focusing on long-lasting local-scale pilots and training within local and regional contexts. International exchange and cooperation programmes should support these pilots. **Initiating 100 local pilots by 2030 is both a desirable and achievable goal**.

4 Business opportunities and saline agriculture

Several case studies show that with specialised care and the use of specific crop varieties, commercially viable farming practices can be achieved on salt-affected soils where traditional methods would yield almost no results. The example of successful projects conducted by a social enterprise, the Salt Doctors[1] in Kenya, Bangladesh, Pakistan, and Egypt are presented below.

4.1 Successful case studies

Effects of improved variety and cultivation – Kenya 2018

Salinity is a major agricultural challenge in Kenya. A consortium of Dutch partners addressed this issue by applying salt-tolerant cultivation techniques to grow crops – particularly carrots – on moderately saline soils. By using carrot varieties that had been shown to be highly tolerant to salinity in Dutch trials and comparing them with a local variety, a 94% increase in yield was achieved. This remarkable improvement was warmly welcomed by local farmers. In addition, the use of organic mulch reduced irrigation water consumption by 20-40%. However, local farmers expressed a preference for the taste of their traditional carrot varieties over the newly introduced ones. This highlights the importance of matching high-yielding crops to local market preferences and finding a suitable market niche, as even a high-yielding crop can struggle in the marketplace if it does not meet consumer tastes.

The Salt Solution – Bangladesh 2017-2019

Coastal Bangladesh faces severe salinity problems affecting over 1 million hectares of land and causing significant migration, potentially affecting 27 million people by 2050. To address this, salt-tolerant varieties of potato, cabbage, cauliflower, carrot and beetroot have been introduced at farm level, and 5,000 farmers have received training and support. Intensive monitoring at 50 sites showed varying levels of salinity, with the majority of sites having moderate salinity (4-12 dS/m). Two years into the project,

[1] https://www.thesaltdoctors.com/

evaluations showed a 34% increase in household income (SDG 1), an improvement in food security from 15% to 65% (SDG 2), and an increase in vegetable consumption from 26% to 74% (SDG 3). Much of the project's success has been attributed to the effective use of previously uncultivated, salt-affected land, with 76% of farmers using it by the end of the project.

Implementation: potato production under saline conditions – Pakistan 2016-2017

In Pakistan, 4.2 million hectares of land are affected by salt. With limited freshwater resources available, farmers are forced to use brackish groundwater to water their crops, reducing overall yields and quality. Floods and sea water intrusion wipe out crops with increasing regularity. In this case study, a salt tolerant variety of potato was introduced. Just like in the project in Kenya, the potato variety used in this project had previously increased tolerance to salinity in fields in The Netherlands.

The crop was successfully grown using irrigation water with salinity of 8.7 dS/m and fresh water, alternating between the two water sources. This way, 50% of fresh water was saved, since the water with a high EC was considered unproductive and the local farmers never used it. In terms of crop yield, a yield increase of 28% compared to the local variety on average over ten different farms.

DESALT – Egypt 2020-2021

As part of the DESALT project (Dutch-Egyptian Saline Agriculture and Water Management), a field trial was conducted to evaluate the performance of eight organic potato varieties on saline soils using two compost treatments (18 t/ha and 45 t/ha) in addition to standard organic fertiliser. The trial was conducted on a 4,000 m² loamy sand field with a seasonal mean soil salinity of 5.5 dS/m.

The results showed that four potato varieties achieved a maximum yield of 32 t/ha with the higher compost treatment, representing a yield increase of 27-54% compared to the lower compost treatment. A cost-benefit analysis showed a profit increase of up to 14%, based on low potato prices at harvest, which could rise to 88% under conventional market conditions in Egypt. The study shows that applying significant amounts of compost to saline soils significantly increases potato yields, justifying the additional investment required. Additionally, it highlights that organic saline agriculture can generate higher profits than conventional agricultural practices.

4.2 Case of quinoa in Morocco: opportunities and challenges for (international) investments in saline agriculture

Heer (2023) carried out a study on the opportunities for impact investment in saline agriculture focusing on the production of quinoa in Morocco. He proposes a framework for the evaluation of investment proposals (see Figure 1).

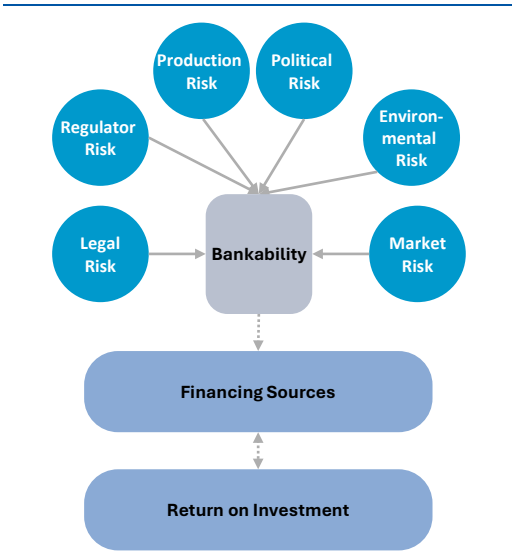

Figure 1 Overview of the bankability framework compiled from Lessambo (2022), Zhu & Chua (2018), and expert interviews, as cited by Heer (2023)

Heer considered risk elements of investing in the upscaling of the production of quinoa in Morocco. The example of quinoa impact investment in Morocco features a number of overarching conclusions. First, the bankability of saline agriculture depends on several country risks and returns on investment. Risks and returns will influence the availability of financing sources, depending on the financiers' expected returns and the associated investment risks. Thus, bankability for impact investors depends on political, environmental, legal, regulatory, production, and market risks.

Second, regarding political, legal, and regulatory risks, it is imperative to have some form of government support, a stable legal environment, and sound regulations. Specifically for agriculture, land rights need to be clearly defined, and risks of expropriation should be minimised to foster investor confidence.

Further, environmental and production risks need to be manageable. Since saline agriculture is regarded as a form of adaptive agriculture, it addresses many environmental risks excellently. However, production risks can still severely limit the bankability of such projects if these are not addressed. Firstly, saline agriculture projects must provide constant yields to investors with continuous and predictable cash flows. Secondly, production risks can be minimised by educating agricultural entrepreneurs and mechanising crucial steps in harvesting and processing. Hence, investment in mechanisation and irrigation will prove to be critical to reducing production risks.

Moreover, while investments in irrigation are not feasible for smaller-scale farmers, it is a key requirement to make saline agriculture projects bankable for private impact investors. Governments should promote access to irrigation and subsidise it. Through targeted public and private investments, saline agriculture projects will be able to deliver economic, environmental, and social returns.

Finally, the type of financier required varies depending on the scale of the project. Governmental support is crucial for many initiatives.

5 Recommendations

The following measures will unlock the potential of saline agriculture, contributing to global food security and climate resilience:

1. **Recognise Saline Agriculture as a Climate-Smart Practice**: Policymakers should formally include saline agriculture under the broader umbrella of climate-smart agriculture. This recognition will facilitate targeted funding and policy support.

2. **Bridge the Funding Gap**: International development banks and climate funds should develop hybrid financing models that combine grants and concessionary returns to better support small- and medium-scale saline agriculture projects. Expanding the role of microfinance institutions and adjusting their investment criteria can also improve access to necessary financial resources for local farmers.
3. **Promote Pilot Projects**: National governments and international institutions should prioritise **funding for at least 100 long-term saline agriculture pilot projects by 2030** as well as facilitate cooperation and best-practice exchange among them. These pilots should be accompanied by training programmes and knowledge exchange to foster innovation and scalability. In addition, these training programmes and networking activities will support early investor engagement to enable economic growth.
4. **Enhance Government Support**: Governments should establish clear regulatory frameworks, including stable land rights and irrigation subsidies, to mitigate political and production risks. These actions will encourage both public and private sector investment in saline agriculture.
5. **Encourage International Cooperation**: Strengthening international cooperation through exchange programs and shared learning platforms will help address technical, financial, and market-related challenges in scaling saline agriculture globally.

6 Conclusions

Saline agriculture presents a promising avenue to address food security challenges in the face of climate change and freshwater scarcity. Successful case studies from countries such as Kenya, Bangladesh, Egypt , Pakistan, and Morocco demonstrate that with targeted support and investment, salt-affected lands can be productive. However, scaling these practices internationally remains challenging due to financial, political, and production-related constraints. Key barriers include the mismatch between available funding scales and local needs, the limited recognition of saline agriculture in climate-smart policies, and the necessity for both government and private-sector involvement to reduce risks and ensure project bankability.

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