15 Saline Farming in the Wadden Sea Region of the Netherlands

Promising Initiatives for Salt-Tolerant Crops and Saline Aquaculture

Tine te Winkel, Jouke Velstra, Marc van Rijsselberghe, Klaas Laansma, and Titian Oterdoom

CONTENTS

15.1	Introduction	259
15.2	Methods: Practical Experiences	260
15.3	Results	262
15.4	Conclusion and Recommendations	262
	References.....	262

15.1 INTRODUCTION

The coastal zone of the Wadden Sea region in the Netherlands is facing many transitions caused by salinization, climate change, and land subsidence (van de Meij & Minnema 1999; Velstra et al. 2011; Pauw et al. 2012; van Staveren & Velstra 2012). Regional land use is dominated by arable farming which is threatened by these external factors that directly or indirectly increase the risk of salinization. In this case study, based on market research conducted by consulting company Acacia Water B.V. and partners, we analyze in a systematic manner options for adaptation to salinization using different crop varieties and possible future development. A variety is classified as feasible when it has high scores regarding practical application, financial feasibility, and opportunities for large-scale production. We present examples of three main types of varieties: (1) conventional crops with some salt-tolerance, (2) saline crops like samphire, and (3) saline aquaculture. We present an overview of the potential of these three crop types for the more saline future of arable land in the Wadden region. As a part of the program ‘Towards a rich Wadden-Sea’ (‘Programma

naar een Rijke Waddenzee', PRW), this research aimed to provide an overview of the current developmental status of different salinization adaptation measures to assess the feasibility of implementation in the short, medium and long term.

15.2 METHODS: PRACTICAL EXPERIENCES

In recent years, there have been various initiatives for salt-tolerant and saline crops, or saline aquaculture. The projects are generally initiated by applied research groups or are the local initiatives of individual entrepreneurs. One challenge lies in the collection and diffusion of the obtained results: these are often either confidential or remain unwritten and locked-up in the mind of the entrepreneur out of fear from competition. Therefore, it can be hard to determine why an initiative or pilot has ended, even though this could be very important information referring to project feasibility and the feasibility of future investments. The creation of future chances for saline agriculture will require entrepreneurs to step out of the spiral of non-investment because results are not written down. Our study has gathered practical experience through interviews with 10 entrepreneurs who have been working in saline conditions. A complementary desktop study including a review of > 20 publications was performed in combination with verification by three entrepreneurs and four researchers.

Our results in terms of the current status and feasibility of adaptation measures are listed per criterion. The conclusion illustrates the developmental status per criteria and areas where additional investments are needed. Results are plotted on a grey-scale bar (Figure 15.1), where light grey means investments are necessary to further develop cultivation methods or the market supply chain, and dark grey indicates that the relevant criterion is well developed for further implementation. The timeline shows the future potential. The timeline is not meant as a summary of the criterion but indicates when it is reasonable to start development and investment.

FIGURE 15.1 Methodology used to present results per variety.

FIGURE 15.2 Potential in terms of different criteria for salt-tolerant potatoes (a), samphire (b), and cockles (c).

15.3 RESULTS

Based on the analysis, we recommend to choose three routes to pilot in the Wadden Sea region in the short term: (a) development of a salt-tolerant crop rotation plan for potatoes, (b) development of on-land cockle and seaweed cultivation, and (c) development of saline crops such as samphire and sea lavender. Minor saline crops (ice spice, sea kale, and sea fennel) have medium-term development potential.

We have determined the market potential per crop in two interdependent manners: by examining actual demand and marketing (Figure 15.2). For salt-tolerant crops and aquaculture, the emphasis in the early stages of development has to be on marketing to create sufficient demand. Marketing is an important part of the crops mentioned in this study because they are not conventional crops. Our study finds that there are often no sales channels near the farms focusing on saline agriculture, and the necessary infrastructure is often absent.

15.4 CONCLUSION AND RECOMMENDATIONS

Many initiatives in the Dutch province of Zeeland have sprouted because plot conditions for conventional crops became too saline. This has led to promising and successful initiatives. In a similar way, expansion could also be addressed in the Wadden Sea region. Policymakers can identify promising areas for adaptation measures using the salinization risk map (Velstra 2019) after which entrepreneurs are to be approached and opportunities will be discussed. It is notable that the majority of crops and varieties require new cultivation techniques. This requires large investments, a longer transition period, craftsmanship, and an intrinsic motivation for the entrepreneur. Physical preconditions also play an important role in this, not every crop and variety can be grown everywhere, giving the pre-feasibility phase an important place in the process of a farmer switching from one industry to another. The next step will be to take an in-depth look to connect and integrate the above factors and to make choices per crop and geographical location. This step must be taken in collaboration with agricultural entrepreneurs.

REFERENCES

- Pauw, P., De Louw, P. G., & Essink, G. O. (2012). Groundwater salinisation in the Wadden Sea area of the Netherlands: quantifying the effects of climate change, sea-level rise and anthropogenic interferences. *Netherlands Journal of Geosciences*, 91(3), 373–383.
- van der Meij, J. L., & Minnema, B. (1999). Modelling of the effect of a sea-level rise and land subsidence on the evolution of the groundwater density in the subsoil of the northern part of the Netherlands. *Journal of Hydrology*, 226(3-4), 152–166.
- van Staveren, G., & Velstra, J. (2012). *Klimaatverandering, toenemende verzilting en landbouw in Noord- Nederland (Climate change, increasing salinization and agriculture in the northern part of the Netherlands)*. Acacia Water, 333.
- Velstra, J. (2019). *Spaarwater: Rendabel en duurzaam agrarisch watergebruik en waterbeheer in de verziltende waddenregio (Sustainable and profitable usage of water in the agricultural brackish environment of the Wadden Sea region)*. Acacia Water, 1, 79.