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Memo

Urgency to act upon livestock production for climate resilient deltaic food systems

A policy brief

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Inherent to their structure, deltas are complex systems. They consist of complex networks of river channels and tributaries and, together with their strategic location for trade, they have become important hubs for economic activities and human settlements. As a result, they are of high importance having large ports and cities. In turn, high human population densities, fertile soils and the vicinity of ports are also good conditions for animal rearing. For these reasons delta areas have also become places with high livestock densities (including aquaculture). However, deltas are highly vulnerable to climate change. A combination of biophysical factors is in play: 1) Increasing sea levels are the basis for increasing risks of flooding, affecting the safety of people and economic activities. 2) Salt intrusion via rivers, channels and groundwater and the related infiltration into land areas affects plant production and, subsequently, land-dependent livestock production. 3) Events of both an abundant amount and a lack of water – droughts – hinders the availability of adequate qualitative freshwater resources which is a risk for animal (and human) health and well-being. It also hampers crop irrigation (including feed and fodder crops). 4) Land subsidence and environmental degradation amplify the severity and the complexity of climate change related issues in deltas.

Effects on water management caused by climate change have direct consequences on agriculture through change of local natural conditions and more extreme weather events, higher evapotranspiration, natural subsidence, and sea level rise. Depending on factors such as available income, culture, level of efficiency and technology adoption, the impact of the above-mentioned negative effects can be severe and difficult to overcome. They can even affect food security through a direct reduction of available consumable food products and income from agricultural activities in order to buy food.

As an example, the Dutch delta is particularly affected by sea level rise, land subsidence, salinization, and more and longer periods of extreme weather events negatively influencing agricultural production levels and requiring infrastructural investments in protection (dikes) and water management. This can cause lower incomes and higher public costs, respectively. In the Netherlands, employment in agriculture is relatively low, and food security is not yet at stake, mainly due to the possibilities of a large (international) trade system of food and feed. The Ganges Brahmaputra Meghna delta in Bangladesh, on the other hand, faces much more fundamental issues due to the same factors, such as increased risks

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of flooding, food insecurity on the household and local level and higher economic impacts on household incomes. Employment in agriculture is much higher compared to deltas in high-income countries. Lower production outputs result more directly in less food and feed available for the household and the local communities. At the same time, urban communities face an increasing dependence on their region because roads become temporary, less, or inaccessible. The Mekong River delta in Vietnam is an intermediate situation. Technologies and infrastructures are more developed compared to the Ganges Brahmaputra Meghna delta in Bangladesh and livestock production is more reliant on feed imports. But also here, the agricultural sector still plays a vital role in employment and food security. Farmers' income and agricultural productivity are drastically and negatively affected by the above-mentioned aspects of climate change.

Livestock production (including aquaculture) has a vital role in food systems, particularly in low and middle-income countries. Livestock provides a combination of food, income, financial flexibility, a means of savings, draft power, cultural status, the possibility of utilizing by-products, and manure as a source of fuel for cooking or nutrients as a source to fertilize crops. Changing natural conditions and, consequently, altering crop production directly and indirectly affects livestock production and in turn also the food system of which it takes part. A direct effect is for instance heat stress and dehydration from higher levels of salt intake and higher (air and water) temperatures. These effects can negatively influence animal health and thereby animal productivity. It can even result in illness and death. However, symptoms of abundant salt intake can be similar to symptoms caused by other diseases, such as dysentery and fever. The need for proper diagnosis is important to overcome these challenges. Indirectly, periods of drought and higher levels of salinity can reduce feed productivity levels through decreased growth or mis-harvests. Events as such can result in lower quantities of, for example, grasses and crop residues, which are commonly used as animal feeds. In addition, animals can also amplify levels of soil salinity through intake of salt up to a level that can still be tolerated by animals. This will mean more salt in animal excreta. In pastoral areas, or where manure is used as fertilizer, this results in an additional source of soil and water salinization. Although aquaculture differs from land-based livestock, it also depends on the availability of plant biomass and fresh water and can be similarly affected by climate change.

Hence, salinity, drought and elevated temperatures are affecting livestock in several ways, via available feed and water of sufficient amounts and quality. High stocking densities, often already leading to a poor feed supply in delta areas, are amplifying these problems. The limited options of smallholders to act upon these problems make climate change a multifaceted problem: they do not have the opportunities to invest, are lacking knowledge, and an important part of the solution (services, livestock densities at regional scale) is beyond their circle of influence. One the other hand, one should be careful considering adaptation strategies that are sustainable, as livestock production does not only provide protein, but is one of the dominant sources of greenhouse gasses.

A climate resilient food system requires (re)considering the role of animal production at farm, local and regional scale and understanding of, and acting upon, the multiple facets of the problems. Livestock must be an integral part of the diversification strategy to absorb shocks. As food and income security in deltas are under threat, research, and the development

of adaptation strategies for plant- and animal-based food production and consumption require an integrated approach, paying attention to the combination of factors mentioned before, addressing production, nutrition and food safety, income, and environmental concerns.

When looking into these risks, of course, a research focus on crops and water management and the role of salinity on crop productivity is an important contribution. Numerous studies show that research may help to develop salt and drought tolerant crop varieties such as in rice, potato and pomelo cultivation, to develop and test desalinization technologies and systems, irrigation techniques, and to design and build dams to stop saltwater intrusion in coastal areas. Less attention is paid to livestock production despite its important current role in providing food and income in deltas. As mentioned earlier, livestock is often directly and indirectly part of the food system, in particular in low- and middle-income countries. To assess and further develop the role of livestock in food systems, research should focus on holistic approaches towards suitability of animal types and breeds within changing biophysical conditions, crop-livestock interactions, the temporal availability, quality and accessibility of feed and water, and their consequences on the animal health at distinct stages of their life and their related productivity levels. It requires careful considerations between different scales and sectors. For instance, between the inputs, available resources and environmental impacts at farm, regional and national levels and the consequences and benefits of animal rearing for farmers, and domestic and international markets. Also, effects on other production systems such as crop production should be taken into account. For example, manure management (quality, quantity, storage, and application) in new cropping systems that are developed to adapt to climate change. Crop rotations and newly introduced crops and crop varieties shall be scrutinized for their potential to contribute to feed for farm animals throughout the year and at strategic moments. Different solutions may be applicable between different livelihoods and farmers as they have different management strategies and motivations to rear animals. Addressing the complexity of the changing situation cannot solely be solved by technical interventions at the farm level. On the one hand, it must imply actions in the agricultural production chains and supporting services at the regional level of the delta as well. On the other hand, research and action are needed to reflect on livestock densities at regional scale, to optimize total food production and resilience of agri-food systems without harming the environment. The suitability of regulations, institutions and partnerships should be included in the analysis. Therefore, there is an urgent need for a balanced integration of livestock, crops, water and soil management in research and action strategies for the development of climate resilient and sustainable food systems in deltas.

In conclusion, climate resilient and sustainable deltaic food systems are required to contribute to the UN sustainable development goals, with the most important being the reduction of poverty, zero hunger, clean water and sanitation, responsible consumption and production, and to address climate change. Effective measures and strategies at the farm and regional level are lacking. As livestock production is an important part of deltaic food systems this should be considered, which calls for a comprehensive diagnosis within an integrated research approach to better understand the underlaying factors and complexity of climate induced livestock production challenges. And enables to inform decision makers to set out rules and practical solutions for farmers, livelihoods, and regional planners.

Further information: www.wur.eu/food-in-deltas
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