

Exploring the resilience of vegetable growers in a country facing rapid environmental and socio-economic changes, the case of fresh tomato in Morocco

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In a world characterized by globalization of agricultural markets and climate change, farmers are increasingly exposed to various types of stresses and shocks, hence the need to build their resilience. For horticultural growers, this is all the more striking as vegetable production, such as tomato, is input demanding and therefore dependent on various exogenous factors. Moreover, the perishability of fresh fruits and vegetables exposes producers to significant market price volatility, increasing their vulnerability.

In Morocco, the agricultural sector has evolved during the last decades around the willingness to develop a modern agriculture while building up smallholders' welfare. This strategy has mostly been supported by the Green Morocco plan (GM - Plan Maroc Vert), a national policy implemented in 2008 and developed around two pillars. The 1st Pillar aims to develop a modern, high added-value and competitive agricultural sector, through private investments and export agreements. On the other hand, the 2nd Pillar aims to organize support for small and medium-sized farming, with an approach geared towards poverty reduction and income improvement for the most vulnerable farmers (1). One of the main consequences of this policy is that the Moroccan government has promoted export-oriented agriculture. With the main objective of supporting export of fresh fruit and vegetables, Morocco became one of the leading export nations of fresh tomatoes and citrus fruit.

However, 10 years after its launching, this agricultural development policy has rather fostered a productivist model, contributing especially to increased stress on natural resources, such as water. The overexploitation of groundwater supplies, along with a succession of drought years has led to sea water intrusion, affecting the quality and availability of groundwater resources (2). While this situation is soon to be addressed in the export-oriented region (Souss – Massa) by the establishment of a desalinization plant, the other domestic production-oriented regions, like Rabat – Salé – Kenitra, are facing the same issues without having a long-term relief plan. This raises concerns about smallholder welfare and their ability to cope with changes or develop their resilience.

This project explores the dynamics of the tomato production system in two regions of Morocco and their effects on the environment, as well as on the socioeconomic development of the producers. It illustrates the synergies and trade-offs between different goals such as productivity, resilience and sustainability under rapidly changing framework conditions. Based on a system dynamics model, this evaluates the effectiveness of the Green Morocco plans and other potential policy interventions in Morocco.

The model focuses on long-term dynamics over 20 years. It looks at regional level developments and represents both open-field production (in Rabat – Salé – Kenitra Region) for the national markets only, and greenhouse production (in Souss- Massa region) supplying both export and national markets. A first set of data consists of scientific literature and official reports from various Moroccan ministries. The second set of data was collected during a recent field visit and through a survey gathering

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information on 245 tomato growers in both regions, on the specifics of their farming system, from agricultural practices to market linkages.

Open-field production and greenhouse production perform very differently; on the one hand, greenhouse production is more mechanized, with agricultural practices meeting exports-standards, generating higher yield (188 t/ha), but also benefiting from better connection to conditioning plants and cooperatives that ensure the link to export markets. In addition, the more capital and profit there is, the better the quality of agronomic practices and water accessibility (through boreholes and wells) will be, increasing the yield, the revenues and the profit. This situation describes a reinforcing feedback loop that operates in the short term. The reference mode of behavior is a rapid depletion of the groundwater table, mostly because of intensive production – causing not only environmental damages but also, reinforcing socioeconomic inequalities between users (3).

Under other conditions, smallholder farmers are producing tomatoes on irrigated open-field (from April to October) along with other vegetables throughout the year, generating lower yields (56 t/ha) in smaller but more diversified farms. Those smallholders often remain poor because their land holdings are small, they have large families, are highly dependent on agriculture, have poor access to infrastructure and markets, and limited opportunities to improve their living standards (4). Groundwater overexploitation leading to sea water intrusion is also modeled. The more water that is pumped, the more sea water intrusion there is in the long run, affecting the yield and subsequently farmers income. This is also reinforced when the region is facing a drought, like for example in 2016.

Furthermore, extreme weather events such as drought have become more frequent in the country, raising concerns on the ability of producers in both production systems but especially in open-field production to recover from those shocks, and build more resilience. In this case, a more resilient food system is one that is capable to limit the impact of a disturbance, is able to recover from it and increases its functionality (5). In such context, the functionality of the system is not only to ensure the maintenance or growth of their private goods provision, proxied for example by producers' income, but also to be able to deliver public goods and services, such as ecosystem services. Based on this conceptual framework, model simulations show that while exporters have a better capacity to withstand shocks, the functionality of the natural system is slowly depleting, leading to a long-term failure of the intensive greenhouse production system. The simulation model enables us to facilitate a discussion on the necessary ties between resilience and sustainability. The Green Morocco Plan can be presented as a short-term success that has enhanced agricultural productivity of some specific producers. However, this policy has also led to increasing socioeconomic inequalities, continuous groundwater depletion and price volatility in markets (3, 6) and thus requires complementary policies for ensuring both sustainability and resilience in the long run.

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