Palestine Economic Policy Research Institute (MAS)

Food Security and Viral Diseases (in Fruit Trees)

Raed Al-Kouni
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Mission

MAS is dedicated to producing sound and innovative policy research, relevant to economic and social development in Palestine, with the aim of assisting policy-makers and fostering public participation in the formulation of economic and social policies.

Strategic Objectives

- Promoting knowledge-based policy formulation by conducting economic and social policy research in accordance with the expressed priorities and needs of decision-makers.
- Evaluating economic and social policies and their impact at different levels for correction and review of existing policies.
- Providing a forum for free, open and democratic public debate among all stakeholders on the socio-economic policy-making process.
- Disseminating up-to-date socio-economic information and research results.
- Providing technical support and expert advice to PNA bodies, the private sector, and NGOs to enhance their engagement and participation in policy formulation.
- Strengthening economic and social policy research capabilities and resources in Palestine.

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Palestine Economic Policy Research Institute (MAS)
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Forward

This study addresses an important theme related to food security: combating horticultural problems, particularly the viral diseases of fruit trees. It may seem that this is a remote subject for MAS, an economic policy research institute. However, designing a successful strategy to select the best plant species, protecting and developing high-quality fruits and adopting a successful plant certification system in Palestine have obvious consequences on agricultural production and productivity.

Protecting, preserving and improving the quality of fruit trees have clear economic consequences, as well as important cultural and environmental dimensions. Protecting and improving the quality of olive-trees, for example, and preserving unique plant species in Palestine blends and fulfills economic, social, cultural and even national goals.

I hope that this study, carried out as a part of the research effort of the food-security unit at MAS, will trigger and spread the awareness of the need to combat viral diseases. I also hope it will mobilize public interest in protecting plant life in Palestine and put in place a national strategy for plant certification. Lastly, I would like to thank the Spanish Cooperation (AECID) who funded this study through Asamblea de Cooperación Por la Paz (ACPP).

Numan Kanafani
Director General

Executive Summary

The Food and Agriculture Organization of the United Nations (FAO) defines food security as when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. The apparent lack of understanding of this (flexible) concept among PA ministries and relevant institutions is amplifying the damaging effects of the Israeli occupation on the food security situation in Palestine.

Preparing a national strategy for food security is an important step towards greater food security. Developing mechanisms to implement the strategy present great challenges. MAS uses national facilities and Palestinian scholars in order to further collective efforts to achieve such national objectives.

Agriculture is considered an important sector for Palestinians in the West Bank and Gaza Strip (WBGS). As well as directly contributing to the national economy, it is a symbol of Palestinian culture and existence on the land and a major element for food security. Agriculture also plays a crucial role in protecting the environment, enhancing biodiversity and combating desertification.

Horticulture is a particularly important sub-sector in Palestinian plant production, occupying 63.5% of the area cultivated in the Palestinian Territories. This study focuses on frequently occurring horticultural problems in land devoted to agricultural use. The study makes a series of recommendations with the aim of significantly increasing yields and developing product quality to levels more comparable with developed countries. Production levels are so low partly due to viral infections, which can be prevented through the production and distribution of sanitised propagating material. This study proposes that a system is adopted that ensures all plant reproductive materials are screened for viruses. More generally, by developing and improving horticulture throughout the country, yields and food availability will increase, thereby bringing the Palestinian community closer to achieving food security.

Cultivated plant species are subject to several pests and pathogens that can seriously damage the quality and quantity of their yield. Pests and pathogens alter the plants' natural equilibrium, resulting in production

losses of between 30 and 40%, and lower product quality, which is a greatly important market factor. These negative effects on production are coupled with higher costs for the farmer since pests and pathogens must be controlled with pesticides and fertilizers, (products that have a severe ecological impact and harmful repercussions on the health of consumers).

Diseases induced by intracellular infectious agents (viruses, viroids, phytoplasmas) represent a major threat, particularly to fruit trees, and can stunt growth. The wide geographical incidence of these diseases is a result of the inefficacy of the standard methods used to control plant viruses. Their spread is also due to vectors (any agent that carries and transmits a disease) and from the diffusion of vegetative-reproductive plant material (material that reproduces asexually). It is however humans who are mainly responsible for spreading infectious diseases over long distances, through uncontrolled circulation of plant material and trading stock that may be virus-infected.

There is insufficient data available about the sanitary status of crops in the Palestinian Territories. This is due to a lack of facilities and equipment for diagnosing diseases, lack of specialised technicians and scientists, and the poor organisation of nursery and farming activities. The first publications about the sanitary status of the main fruit tree crops cultivated in Palestine were prepared by the Mediterranean Agronomic Institute of Bari (IAMB) in collaboration with the Palestinian Ministry of agriculture, between the years 1996 and 2003. These studies periodically tested samples of grapevine, stone fruits and limited numbers of olives and citrus for infections. Results showed how the sanitary status of these crops had deteriorated. Subsequent studies by Palestinian scientific institutions (Bethlehem University, Hebron University, etc) confirmed the detection of viruses in stone fruits and grapevines.

In the absence of classical methods (i.e. using pesticides for elimination of infection *in vivo*), viruses can only be controlled through “Protection measurements” such as preventing the distribution of infected plant propagating material. This is most efficient when carried out with a clonal and sanitary selection process. This procedure can be maintained by following clonal and sanitary protocols that are already applied in some European Union countries for vegetative-propagated plants (e. g. grapevine, stone fruits, citrus etc.)

There are several stages involved in ‘Protection measurements’. Plant species are first selected based on botanical features (pomological

characteristics) that correspond to consumer taste and demand, ensuring commercial potential. This process is often termed as 'variety evaluation for trueness-to-type' or 'Clonal selection'. Following selection, the chosen varieties are checked for being consistently virus free. After at least two years of field observation, cuttings from these 'clones' should be collected and propagated in at least two plots, located in different ecological areas. They should again be checked periodically for any viral infection. The established "Collection plots" are then subjected to 'sanitary protocols in order to prevent vector-mediated (insects, nematodes, fungi) or man-mediated (grafting, propagation by cutting) viral infections. These protocols include: using soil that is pathogen free; being separated from the other similar fields; being planted under screen houses if there is a risk of attacked by air-borne viruses (insect-vectors). After one or two years of inspection and testing, this plot can be considered as the 'Primary source plot' for crop species and homologation ('Registration of cultivar') procedures can begin. In the case that one crop variety has a viral infection and there is no healthy and similar crop available to replace it (locally or internationally), a sanitation process (such as heat therapy, meristem-tip culture ...etc) should be applied to get rid of the infection.

Cutting vegetatively reproduced plant material from the 'Collection plot' (established as a result of clonal and sanitary selection) produces what is called "Pre-base" propagating material and should be used to establish a "Pre-multiplication plot". It is worth stressing that both plots (Collection and pre-multiplication plots) should be under the provision of the Ministry of Agriculture and other scientific institutions. The vegetative-propagated material coming from the 'Pre-multiplication plot' is called "Base-propagating material" and can be used to establish a third plot, (which by certification protocols is called the "Multiplication plot" or "Mother block"). The third plot is the responsibility of nurseries and/or their societies. The vegetative-propagated plant material from the 'Mother block' is referred to as the "Certified" plant material (seedlings, rooted cuts, seeds) as is what is finally sold to farmers.

This entire process, from selection to selling the clean plant material to farmers, ensures that there is no viral infection in vegetative-propagating materials. Periodic tests must be performed in all plots to confirm they are virus free.

In seeking to improve agricultural production in the Palestinian Territories, (by producing healthy propagating materials through clonal and sanitary selection and with a certification program), this study referred to examples

from developed countries. It looked at their experiences of the procedures / techniques outlined above and the success of reducing viral levels in plant material. The oldest examples of successful fruit certification programmes come from the United Kingdom and Netherlands. In 1977, an official certification program was organised in Spain, while in France one was established in 1982 for the selection, multiplication and control of fruit tree material. In Italy, stone fruit certification activities began in a number of districts and officially extended to the rest of the country in 1992.

An estimated 30-40% of crops are lost due to viral infections in the Palestinian Territories. By increasing the productivity of fruits per dunum and the value added to the fruit industry, the economic impact of applying clonal and sanitary selection on distributed plant propagating materials can be calculated. With the successful application of the recommended procedures, fewer pesticides need be used, impacting positively on the environment. Also, if successful, plants could be certified (to be healthy and virus free), they may find new export potential in countries with strict regulations.

This study recommends that sanitary regulations on distributing propagating materials are quickly adopted and a certification program is established. Governmental backing is also crucial and involves logistical support (introducing and regulating rules and legislation) and financial support. For this whole project to be successful, the cooperation of the Ministry of Agriculture with governmental and non-governmental organizations working in the agricultural sector is of paramount importance. Scientific institutions should also be involved to give the scientific and technological support necessary for securing reliable results. The role of the private sector in supporting this process is of course essential too.

The processes described above require knowledgeable and skilled personnel. Efforts must be made to develop human resources- to educate and recruit Palestinian skilled persons. Collaboration of the “phytsanitary team project” with scientific boards (national and international) is vital for supporting personnel with up-to-date information, techniques and protocols. International cooperation will strengthen these efforts, through sharing experiences and signing agreements to swap plant material. It would also help open the international markets to Palestinian horticultural products.