



**POLICY BRIEF EVOCA #3**

**Multi-level coordinated action  
to safeguard potato production  
from bacterial wilt disease**



## *Potato: Reducing poverty while improving food and nutrition security and livelihoods*

In Ethiopia, potato is a vital source of nutritious food and income for millions of smallholder farmers. In a country with the largest area of suitable arable land for potato production in Africa, farmers grow potato both in the main rainy season (Meher) and the short rainy season (Belg), and in the dry season with irrigation. Over the last fifteen years, the area of land cropped with potato has significantly expanded from 62,000 to over 296,000 ha, becoming the fastest growing crop in the country (1). It is widely consumed in rural and urban areas contributing to food and nutrition security, income and improved livelihoods for farmers, consumers and other market actors. The country also earns the much-needed foreign currency from potato export to neighboring countries such as Sudan, Djibouti and Somaliland. The potato sector provides employment opportunities to unemployed youth as processing companies are emerging in the country. Compared with cereal crops such as wheat, maize and teff, potato gives the highest yield per plot of land, which makes it a reliable crop to cope with food insecurity problems and improve the income of smallholder farmers.

*A farmer with his by bacterial wilt infected potato plant.*

### ***Bacterial wilt as a production constraint***

Aforementioned positive developments and promising prospects cannot gloss over the lingering challenges that the potato sector faces. The average yield is around 14.2 t/ha, an amount far below the attainable yield of up to 50 t/ha under improved technologies and management practices in Ethiopia (2). Disease pressure, particularly bacterial wilt and late blight of potato are the most important production constraint for farmers. The prevalence of bacterial wilt has been historically limited to a few parts of the potato-growing areas in Ethiopia but because of the meagre attention the disease received, it has now become the most serious threat to potato production. Both seed and ware potato production are highly affected by the disease, jeopardizing the seed system and food and nutrition security efforts. Owing to the disease's complex and multiple spreading mechanisms, effective management of bacterial wilt requires multi-level coordinated action among different actors involved in the production, marketing, distribution, quality control, research and extension of potato.

### ***African case study provides scientific insights***

This policy brief shares research findings of an interdisciplinary research programme titled '*Responsible life-science innovations for development in the digital age: Environmental Virtual Observatories for Connective Action*' (hereafter referred to as EVOCA) that was implemented between 2016 and 2021 by Wageningen University and Research, together with international and local partner organizations. EVOCA developed and researched participatory monitoring systems, virtual platforms, and digital applications geared towards facilitating connective action regarding six different complex problems in four African countries (Rwanda, Kenya, Ghana, and Ethiopia). This policy brief aims to inform policy and practice around seed and ware potato production, marketing, and distribution, primarily targeting the public extension system, government seed quality control and regulatory bodies, research centers, NGOs, seed producer cooperatives, and private sector actors who interact with seed and ware producers.

### ***Multi-level efforts to safeguard production Systemic-level efforts***

Bacterial wilt (caused by the bacterium *Ralstonia solanacearum*) is a complex and multi-level problem whose effective management merits coordination of efforts of multiple actors at community and broader system level. Coordinated efforts among various actors should be catalysed through increased investments in learning about the disease, disease monitoring and regulatory practices, quality seed supply and collective disease management practices.

### ***Strengthening the quarantine system at regional and national levels***

The existing sub-optimal seed quality control and quarantine system does not effectively control free movement of infected seed tubers across the different regions of the country. Regional level seed quality regulatory bodies have several limita-



*Stakeholders discussing possible coordination mechanisms.*

tions in technical capacities and infrastructures. The federal and regional governments should put more effort into strengthening regional level quarantine systems through skilled human resources and laboratory facilities to properly diagnose the disease and regulate the movement of infected seeds.

### ***Reliable supply of disease-free early generation seed is needed***

#### ***Enhancing the supply of quality early generation seed***

Given the current high prevalence of bacterial wilt in the seed potato system, seed cooperatives need to frequently flush out seed stocks. To this end, reliable supply of disease-free early generation seed is needed. Work remains to be done in improving the capacity of research institutes to regularly supply sufficient early generation seed to farmer cooperatives and other seed producers. Encouraging private companies to involve in early generation seed multiplication would also contribute to the broader goal of sustaining the country's potato sector by tackling the disease. This goes in tandem with developing the capacity of seed quality regulatory bodies for regular testing and monitoring of the quality of early generation seed produced by agricultural research centers. Continued investment and collaboration between the government agricultural offices, NARS, international research organizations play a pivotal role in this regard.

### ***Decentralized quality seed production could help satisfy the seed demand of a particular region, while minimizing the risk of disease spread***



*Provision of early generation potato seed to farmers was part of the research experiment.*

### **Promoting decentralized seed production**

Latently infected seed potato moves freely from one region to the other spreading the disease nationwide. As part of the effort to alleviate this problem, decentralized quality seed production could help satisfy the seed demand of a particular region or district, while minimizing the risk of disease spread. In this regard, NGOs and government extension offices could jointly work to identify suitable areas for seed multiplication and support ware producers in the respective areas to be end users of the seed produced in their locality. If the seed has to be transported from one region to another, for instance, by seed emergency projects, strict quality assurance needs to be affected by the regulatory bodies, including latent infection of bacterial wilt.

### **Streamlining extension service delivery**

Empirical evidence shows that extension workers have limited knowledge about the disease and the available management options (3). For effective management of the disease, the research and extension service delivery would highly benefit from further training of crop protection extension workers on the epidemiological characteristics of bacterial wilt (e.g. cause, symptoms, spreading mechanisms) and available management options.

### **Compensation schemes for seed potato producers**

In principle, when seed potato farmers' crop gets infected by bacterial wilt, the farmers need to sell the produce as ware potato upon harvesting or safely dump it if the problem is observed after storage. However, this hardly happens due to a number of factors, including significant price difference between seed and ware potatoes, seed supply shortage, and low economic conditions of farmers. Hence,

promoting an insurance scheme for seed potato growers can contribute to the safeguarding of seed potato business from disease problems like bacterial wilt. The public extension system, research and NGOs working on the potato sector can facilitate linkages with insurance companies already working in the agriculture sector.

### **Promoting amelioration of soil acidity using lime**

Under highly acidic soil condition, there is high incidence of bacterial wilt. Thus, soil acidity management requires attention as a prerequisite to manage bacterial wilt under acidic soil conditions (4). In this regard, smallholder potato farmers will have better chance of managing bacterial wilt if they have access to sufficient amounts of lime. This requires enhancing the supply of lime through the government-supported farmer cooperatives and integrating lime application into the extension service package for effective control of the disease.

### **Community-focused efforts**

#### **Enhancing farmers' knowledge about bacterial wilt and its management**

Recent studies revealed that farmers have limited knowledge of the disease, including its cause, spreading mechanisms and management methods (4). This is partly attributed to the existing knowledge gaps of extension workers on the disease and its management options. Governmental and non-governmental extension service providers should give due attention to specific disease management aspects than just focusing on general agronomic practices for tackling the problem of bacterial wilt. Moreover, existing emphasis of the extension system on seed producers should be broadened to include ware produces for joint learning and exploration about the nature of the disease and its management practices. This would help farmers recognize their interdependency and encourage them to collectively act on their shared problem.

#### **Stepping up existing efforts to develop the capacity of seed producer cooperatives for proper disease monitoring and seed storage is important**

#### **Developing the capacity of seed potato cooperatives in disease monitoring**

Hundreds of seed potato cooperatives are currently involved in seed multiplication and marketing across the main potato growing regions of the country. Stepping up existing efforts to develop the capacity of seed producer cooperatives for proper disease monitoring and seed storage (e.g. diffused light stores) is important. Coordinated effort by regional regulatory bodies, governmental and non-governmental extension services, and NARS in improving the technical skills of the cooperatives' seed quality control and monitoring committee is required. As part of the work in early generation seed supply, it is crucial to support seed potato cooperatives to

regularly renew their seed stock with disease-free starter seed potato to prevent the disease from building up in seed production and marketing.

### **Facilitating collective management practices among seed and ware potato farmers**

Bacterial wilt is a collective risk both to seed and ware potato farmers since they share farm tools and labour. Individual farmer efforts or efforts only among seed potato farmers undermine effective management of the disease. Management methods such as crop rotation, sanitation, and decontamination of farm tools will not be adequate unless all the farmers in the same area cooperate to implement these measures. To this end, all efforts supported by the extension service and the regulatory system in learning/training, disease monitoring and (enactment of) collective disease management practices would be much more effective if both seed and ware potato producers are involved.

## **Key messages**

- While the potato crop has enormous potential for food and nutrition security in Ethiopia, potato production is currently threatened by bacterial wilt.
- Bacterial wilt has become ubiquitous in the Ethiopian seed potato production system.
- Free movement of latently infected seed potato contributed to the spreading of bacterial wilt in the country.
- Government and other stakeholders need to take stringent coordinated action to contain bacterial wilt prevalence and protect the livelihood of millions of smallholder potato farmers in Ethiopia

## **References**

1. CSA (Central Statistical Agency), 2016. *Agricultural Sample Survey, Report on Area, Production and Farm Management Practice of Belg Season Crops*. Statistical Bulletin 578, Addis Ababa. Ethiopia.
2. CSA (Central Statistical Agency), 2021. *Agricultural Sample Survey, Report on Area, Production and Farm Management Practice of Belg Season Crops*. Statistical Bulletin 590, Addis Ababa. Ethiopia.
3. Baye, B., Gebremedhin, W., 2012. *Potato research and development in Ethiopia achievements and trends. In seed potato tuber production and dissemination: experiences, challenges and prospects*. Proceedings of the National Workshop on Seed Potato Tuber Production and Dissemination Mar (pp. 12–14).
4. Tafesse, S., Braam, C., van Mierlo, B., Lemaga, B. and Struik, P.C., 2021. Association between soil acidity and bacterial wilt occurrence in potato production in Ethiopia. *Agronomy*, 11(8), 1541.

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## **Colophon**

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