



POLICY BRIEF

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Tackling bacterial wilt of potato in Ethiopia

Key messages



ETHIOPIA'S ANNUAL POTATO HARVEST is worth more than

USD 1.16 BILLION

with potential for significant further expansion. The crop enhances food and nutritional security, provides cash incomes for over 3.7 million small-scale farmers.

ETHIOPIA'S POTATO CROP

is under threat from bacterial wilt (BW), a disease caused by *Ralstonia solanacearum* (RS). RS was present in nearly all seed potato fields and 40–90% of fields in which the potato crop was grown, causing 40–100% yield losses.



SEED POTATOES IN ETHIOPIA are mostly grown in the cooler, higher altitudes to minimize impact of other viral diseases.

BW has been detected at altitudes above 3000 masl, threatening areas of seed production previously seen as 'safe' from this disease. Transmission of RS through latently infected tubers has played the main role in its spread.



COMPREHENSIVE INSTITUTIONAL SUPPORT is needed to control BW and prevent the spread of RS in seed potato.

Policymakers need to ensure that the quality of Early Generation Seed (EGS) (used to produce certified disease-free seed potatoes) is safeguarded by appropriate test that can detect infection with RS.



ETHIOPIA NEEDS a commercial seed potato industry that produces certified seed;

currently just 1.3% of seed potato comes from the formal seed sector and farmers are aware of the benefits of good agricultural practices.

1.3%
SEED POTATO

The semi-formal Quality Declared Seed system (QDS),

which relies on visual inspection of seed potatoes, provides a partial solution and should be supported and promoted.



Ethiopia's potato crop in numbers:

- Ethiopia produces 3.7 million tons annually, worth USD 1.16 billion*
- More than 3.7 million small-scale farmers grow potatoes: each produces on average 1 ton a year worth approximately USD 315
- Potato production increased four-fold since 1961
- Average yield is low at 12.5 tons per hectare (2015/16); about 33% of potential yield for small-scale farmers
- Bacterial wilt can reduce yields by 40-100%

Data sources: CSA (2018) and FAOSTAT (accessed October 2018)

* Value of crop calculated based on price (USD 315 per ton) cited by FAOSTAT in their estimate of export market

Background

The potato (*Solanum tuberosum*, also known as Irish potato) is an important crop grown for food and nutritional security and income in Ethiopia. The acreage and production of potato has increased more than four-fold since 1961. The current area under potato is more than 296,000 hectares (ha) (combining Meher and Belg seasons) with total production of 3.7 million tons in 2015-16, more than 99% of which is produced by small-scale farmers (CSA 2018). Potatoes also have the potential to support value addition through manufacture of crisps and frozen chips and supply of washed, branded potatoes in supermarkets (Haverkort et al. 2012).

Nevertheless, the potato sub-sector is still underdeveloped in Ethiopia: yields are very low, 8–13



Figure 1. Symptoms of *R. solanacearum* on healthy looking seed tuber.

BW was first recorded in Ethiopia in 1956 and has spread to major potato growing areas in the country (Figure 1). A recent survey conducted by Ethiopian Institute of Agricultural Research (EIAR) in collaboration with International Potato Center (CIP) in Seed Potato Cooperatives from Amhara, Oromia and Southern Nations, Nationalities and People's regions of Ethiopia (the country's main seed potato producing areas) indicated that nearly all fields surveyed were infested with *R. solanacearum*. In Chencha, the level of BW prevalence was 97% in 2015 and there was complete crop loss in some potato fields (Abdurahman et al. 2017). Now the BW is also reported from Gamo Gofa zone. BW has emerged as a serious threat to potato farmers, potentially impacting the food and nutritional security status of millions of potato farmers and consumers in Ethiopia.

tons/ha, compared to potential yields for smallholder of up to 35–40 tons/ ha. This substantial yield gap highlights a significant opportunity to increase productivity and total production of potato in Ethiopia.

Bacterial wilt (BW), caused by *Ralstonia solanacearum* (RS), has been a major production constraint to rapidly expanding potato cultivation in Ethiopia, and is one of the most significant limitations to clean planting material production.

RS is mainly tuber-borne, and spreads rapidly through infected tubers intended for planting (seed-tubers) (Figure 1). Because of its wide geographical distribution and broad host range, rapid spread and heavy economic loss, RS is considered a quarantine pathogen in Europe (Directive 2000/29/EC, EPPO A2 list) and is listed as a "Bioterrorism Select Agent" in the United States. Due to the socio-economic importance of the crop and the threat from BW, there is an urgent need to increase awareness about BW, undertake research and implement practical actions to manage the disease.

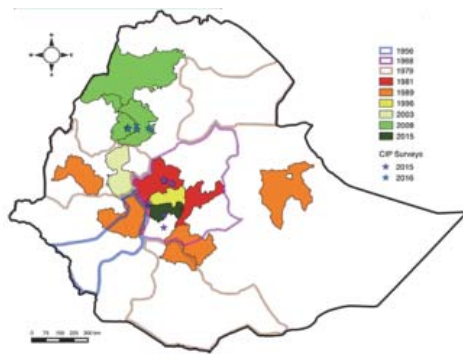


Figure 2. Occurrence and spatial dynamics of potato bacterial wilt disease spread in Ethiopia.

High prevalence of BW in Ethiopia is largely attributable to inadequate quality assurance of seed potato and widespread and large-scale distribution of infected seed. It is important to distinguish between the local spread of RS, due to farmer exchange of small amounts of seed tubers, and the more significant risk of spread associated with high volumes of seed over large distances by organizations. As such, the production and use of RS-free seed potato offer significant opportunities to reinvigorate seed potato to meet required certification standards.

Seed potato production in Ethiopia is concentrated in cooler and higher elevations to reduce impact of virus infection. BW disease symptoms are often overlooked by visual inspection on which certification is currently based. Effective detection of BW requires laboratory testing to detect the RS. In 2015 and 2016, very high BW incidences were recorded in healthy looking seed potato production fields located at elevations exceeding 3000 m, the highest altitude ever recorded for BW in Ethiopia. Discovery of infection in seed potato tubers from 2500-3000 masl is the first evidence of the presence of BW disease in high altitude seed potato production areas of Ethiopia. Rising temperatures due to climate change might have enabled the establishment and spread of RS in areas that were previously RS free. There is an urgent need for policymakers and researchers to address the issue of *R. solanacearum* in seed potato; as it continues to present an escalating threat to the potato value chain, potentially affecting the food security, and livelihood of millions of potato farmers, consumers and the emerging potato industry in Ethiopia (Figure 2).

Managing BW in seed

BW in seed potatoes can be managed through rigorous testing and certification and programs. This has been proven in Europe, and also within Africa in South Africa, and Egypt which have well-regulated formal seed systems

meeting most of their seed demand. However, the formal seed potato certification scheme is not well-developed in Ethiopia, and high-quality seed accounts for only about 1.3% of all seed potato planted (Gildemacher et al. 2009). Most growers save their own seed from year to year or purchase it at informal markets where it is often difficult to differentiate between seed and ware potato (Schulz et al. 2013). Farmers often sell their seed potato as ware potato or vice versa, depending on available market prices. This practice is one of the main factors in contributing to market failure in the seed sector, reduces farmer confidence in the quality of seed potato on the market and increases the risk of introducing RS in potato fields. Quality assurance processes for seed potatoes in Ethiopia are weak and often absent; where they do exist, enforcement is weak. A critical factor in seed potato certification is the diagnostic test for RS, as visual inspection alone is often insufficient, i.e. healthy-looking plants can produce healthy looking tubers which are infected with RS. This presents a challenge to countries like Ethiopia where those in the sector are not well equipped or trained in the use of suitable diagnostic tools.

The lack of a reliable quality assurance mechanism undermines the use of Early Generation Seed (EGS). This is high-quality seed produced under carefully controlled, monitored and regulated conditions with the objective of producing certified disease-free planting materials that can be used to produce seed potatoes. Poor quality at the EGS stage will cause rapid deterioration of seed quality in subsequent generations.

Factors constraining farmers buying high-quality seed potatoes include lack of awareness of the benefits of using such seed and therefore unwillingness to pay. Also, because the existing quality assurance system is poor, farmers tend to have bad experiences even when they do purchase certified seed potatoes.

To mitigate short-comings in certified seed production, CIP and the National Potato Program introduced the Quality Declared Seed (QDS) system as a partial solution (Schulz et al., 2013). The adoption of this system has been included in national seed legislation to complement formal certification targeted at the EGS as feeder-seed to the QDS. QDS is largely implemented by seed producers and community-level regulatory authorities, forming a decentralized labeling regime that is more locally owned and valued. Despite early success of QDS, further interventions are needed to limit the spread of BW; the main limitation has been a reliance on visual inspection for BW. Policymakers need to be aware of the limitations of this approach. They can then prioritize quality assurance processes at the EGS stage and develop evidence-based policies to guide farmers and other value chain actors towards economically viable outcomes.

Managing BW in infected fields

Once it has infected an area, BW is one of the most difficult diseases to manage, largely due to the soil and seed-borne nature of RS. The bacteria can be spread from one field to another by contaminated soil, water, farm tools, infected plants or tubers, and by animals and other farm activities. There is no cure once a potato plant or tuber has been infected. Thus, preventative measures are necessary to manage BW. When infection has already occurred, or the pathogen has been established, several measures are needed to contain the disease.

No single management strategy effectively prevents BW-caused losses. Management of BW should take a systematic approach incorporating operational practices to reduce the likelihood of incursion, and establishment and spread of RS in potato crops (Sharma et al. 2017). This includes training farmers on improved potato production practices, procuring seed tubers declared as RS-free from reputable sources and crop rotations with non-solanaceous crops. However,

farm-level BW control would benefit vastly from a wider institutional approach which included community action supported by research organizations, and national and local policy enforcement and regulatory interventions. This could improve management and control of epidemics as well as containment efforts to stop the spread of the pathogen prior to and during disease outbreaks.

Critical intervention points

- Mobilize institutional support to control BW and prevent its spread in seed potato.
- Promote cooperation between commercial viable seed and ware producers and other value chain actors.
- Encourage the use of standardized molecular methods to ensure the detection of latent infections in tubers.
- Train personnel in the sector to adopt certification practices and use of smart ICT tools and help farmers communities to adopt innovative crop management technologies.
- Raise awareness among all stakeholders of BW disease and farm hygiene practices for its management and containment.

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