

**On-farm evaluation of the effect of positive selection on the
yield of potato (*Solanum tuberosum* L.) under conditions of
high virus disease pressure**

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**A Thesis submitted in partial fulfillment for the degree of Master of Science in
Horticulture in the Jomo Kenyatta University of Agriculture and Technology**

2009

ABSTRACT

Small-scale potato farmers in Kenya have been realizing low yields of 4 – 6 tha^{-1} , far below the achievable target levels of 30 - 40 tha^{-1} . This has been attributed to insufficient clean certified seed production to meet national demand, lack of resources to buy certified seed coupled with degeneration of available seed because of replanting tubers infected with viruses and or other seed-borne diseases. Studies were conducted through Farmer Participatory Research (FPR) approach to evaluate the potential yield increase as a result of positive selection under farmer field conditions. The first step involved training Ministry of Agriculture staff who then acted as group facilitators for the recruited farmer groups. Groups recruited were those that showed cohesiveness and motivation to improve their potato production. Those identified were graduated Farmer Field Schools (FFS), Common Interest Groups (CIGs) or self-help groups already working together. .

The farmers' groups selected were trained on the causes of seed degeneration, and the correlation between poor quality seed and low yields. They established group research plots and were shown how to identify the viral diseases from foliage symptoms. The treatments were positive selection seed, farmer selection seed and the control was commercial seed. Positive selection seed was obtained by selecting healthy looking plants in the field while the foliage was still green, marking them with sticks and using them as mother plants for the next season's crop. Farmer seed was obtained by letting farmers select seed as they normally do. Commercial seed was purchased from authorized seed multipliers. The design used was randomised complete block design with farmer groups representing replications. Subsequent planting of the seed from the three treatments showed that yields from the positive selection plots were significantly higher (95 % level) than those of the farmer selection plots with an average yield increase of ten bags per hectare which significantly increased farm income. Commercial seed gave an average yield increase of eight bags per hectare over the positive selection seed. The viral load significantly decreased in positively selected crop, slowing down degeneration. The control recorded the highest yield (7.6 tha^{-1}) and farmer seed the lowest (6.1 tha^{-1}).

Positive selection required an extra five days labour per hectare, but given the returns, it was clear that positive selection is the most viable option for resource poor farmers to increase their yields and hence income. For most farmers this is a more affordable option in comparison to purchasing commercial seed. In the end farmers need to find a balance between renewing their planting material occasionally, (every 3 – 4 years) and keeping the quality high by practicing positive selection. Through the farmer participatory research approach, farmers were able to own the project and adoption rates of this technology were between 50 – 60 %, compared to conventional research which is 20 -40 %. Farmers also acquired skills for managing virus diseases that are effective and easily applicable.

The study demonstrated that Positive Selection could improve the yields of smallholder Irish potato farmers and hence improve farm income. This study therefore recommends the dissemination of the positive selection technology to smallholder farmers as a cheap and effective measure to increase their yields.