

The '3G seed potato revolution' a strategy to overcome the shortage of quality seed potatoes in Eastern Africa- experience from interventions in Kenya

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Introduction

Potato yields in Eastern Africa are between 6-10 t*ha⁻¹. One of the main reasons for this low yield is the use of poor quality seed potato. Currently the formal seed system is only able to supply less than 1% of the country's demand and on-farm management of seed borne diseases is hardly practiced. Viruses and other seed borne diseases can cause severe seed degeneration leading to reduced yield, quality and income. Viral infections like PVY, PLRV and bacterial wilt are the main diseases affecting seed quality in the region.

To increase the availability of high grade seed potato, CIP together with its national partners, has developed an innovative seed strategy which both lowers the cost of quality seed potato and coupled with extension based interventions to train smallholders in better on-farm management of their own seed. Engagement with the private sector as a means to widen the supply base and satisfy demand for quality seed is also a key component of the strategy.

The strategy involves delivering low cost, quality seed to growers in 2-4 field generations, rather than the conventional 6 to 7 generations, the new CIP strategy has been named the "3G" system. The poster describes experience and results from a 2.5 year USAID funded project implemented in Kenya.



G3 increased quality seed potato supply in Kenya

The introduction & adoption of the 3G system by public and private seed producers changed the availability of basic seed in Kenya dramatically.

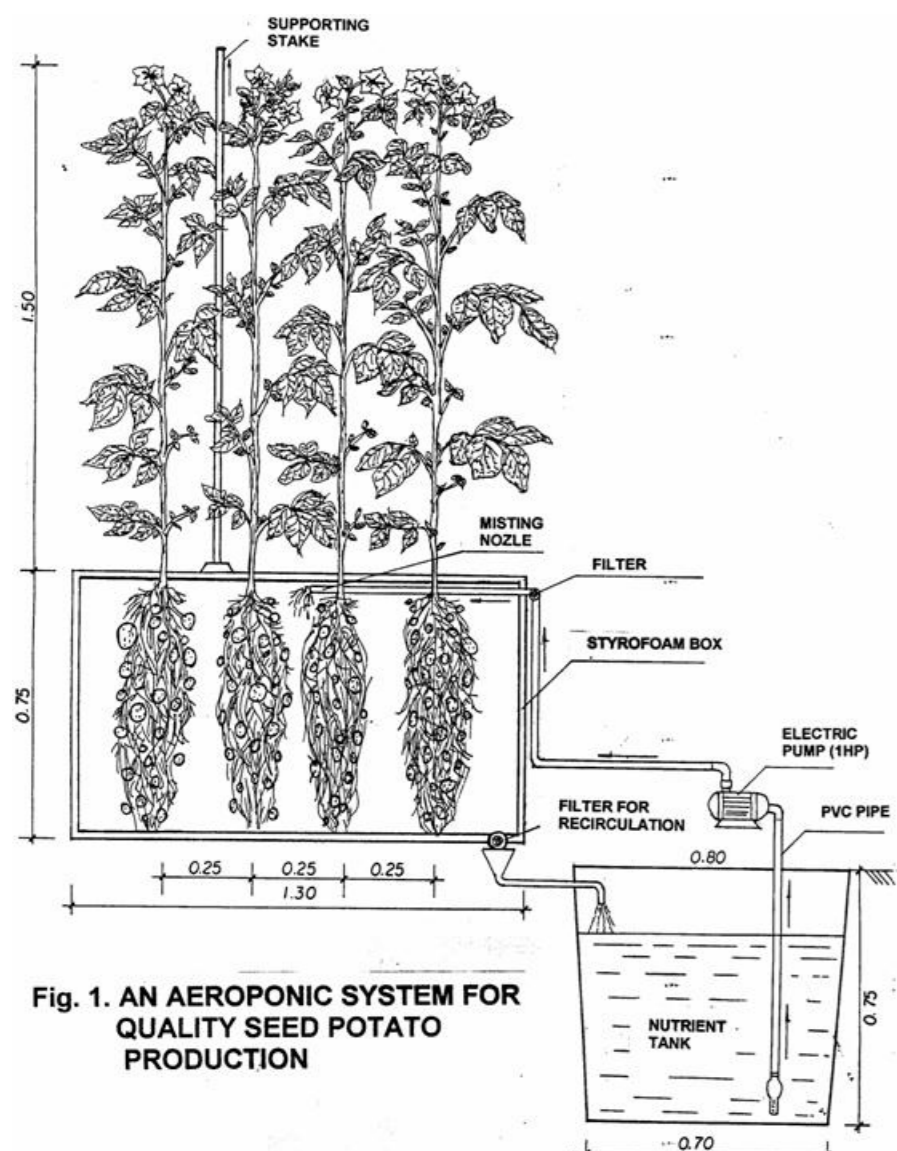


Fig. 1. AN AEROPONIC SYSTEM FOR QUALITY SEED POTATO PRODUCTION

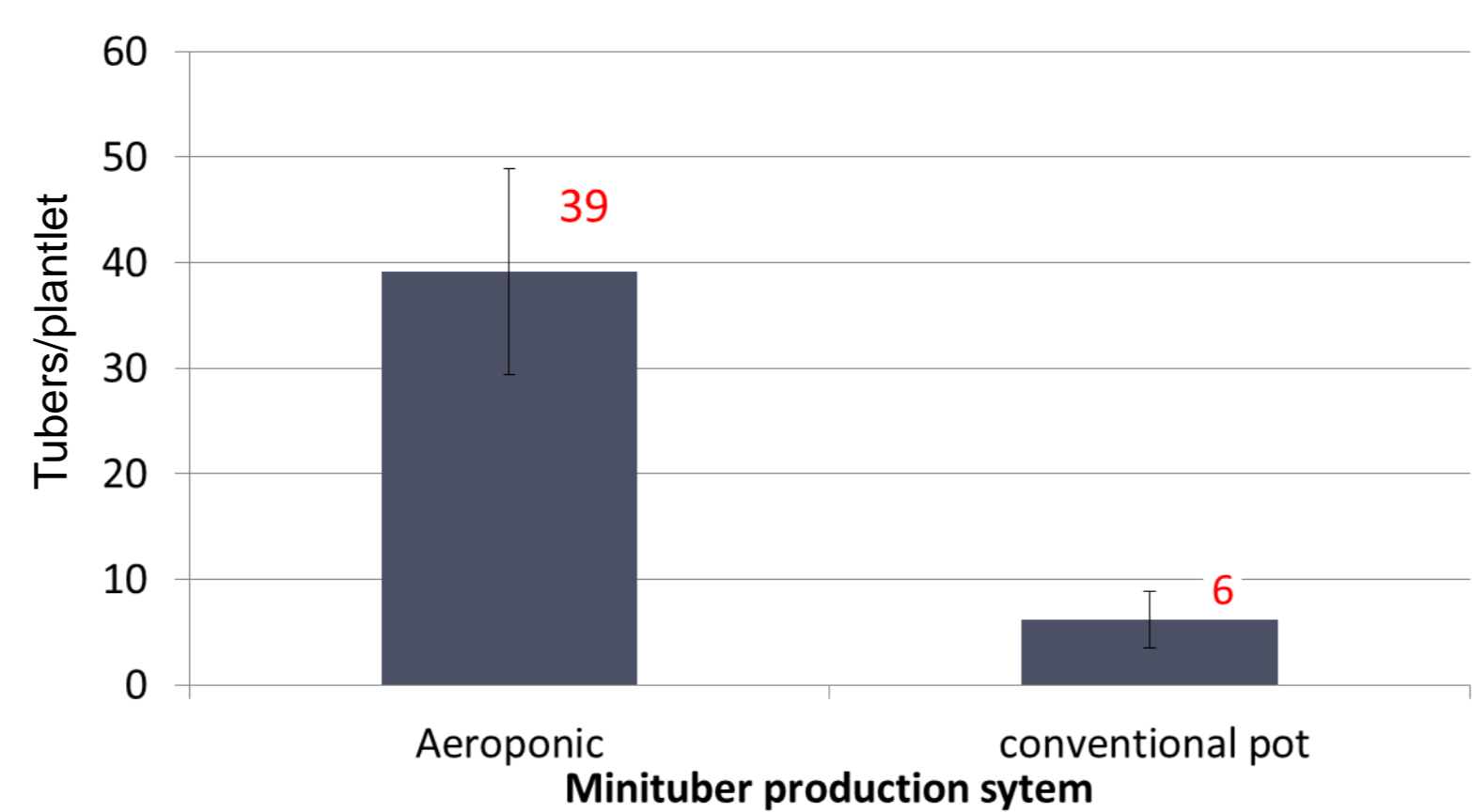


Figure 2. Minituber production performance of two Kenyan potato varieties in aeroponics compared to conventional pot multiplication.

More efficient starter seed production can be pursued through further adaptation of existing RMTs, like the successful introduction of aeroponics technology (Fig.1 and pictures), which in the increased multiplication rate from plantlets more than 6 fold (Fig. 2). Moreover, the technology attracted private sector involvement in the seed potato business. This helped to increase minituber production from 30,000 to 1,000,000 within 3.5 years (Fig.3).

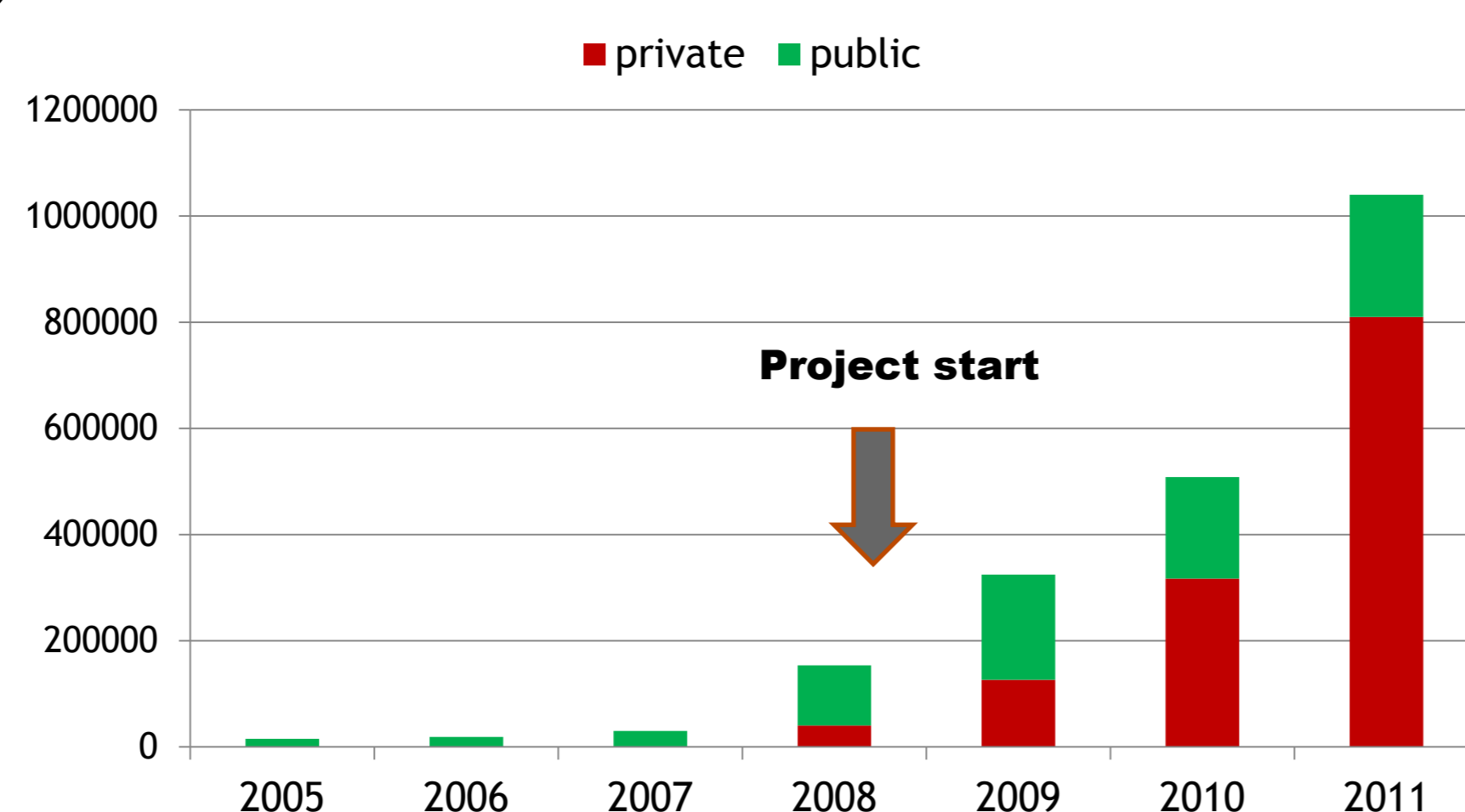


Figure 3. Development of annual minituber production in Kenya from 2006-2011.

Before the introduction of aeroponics and the involvement of the private sector the annual basic seed potato production was ranging between 35-80 tons, with the aeroponics within a period of less than two years about 850 tons of G3 seed (equivalent to basic seed) was realized, in particular by private sector actors (Fig.4).

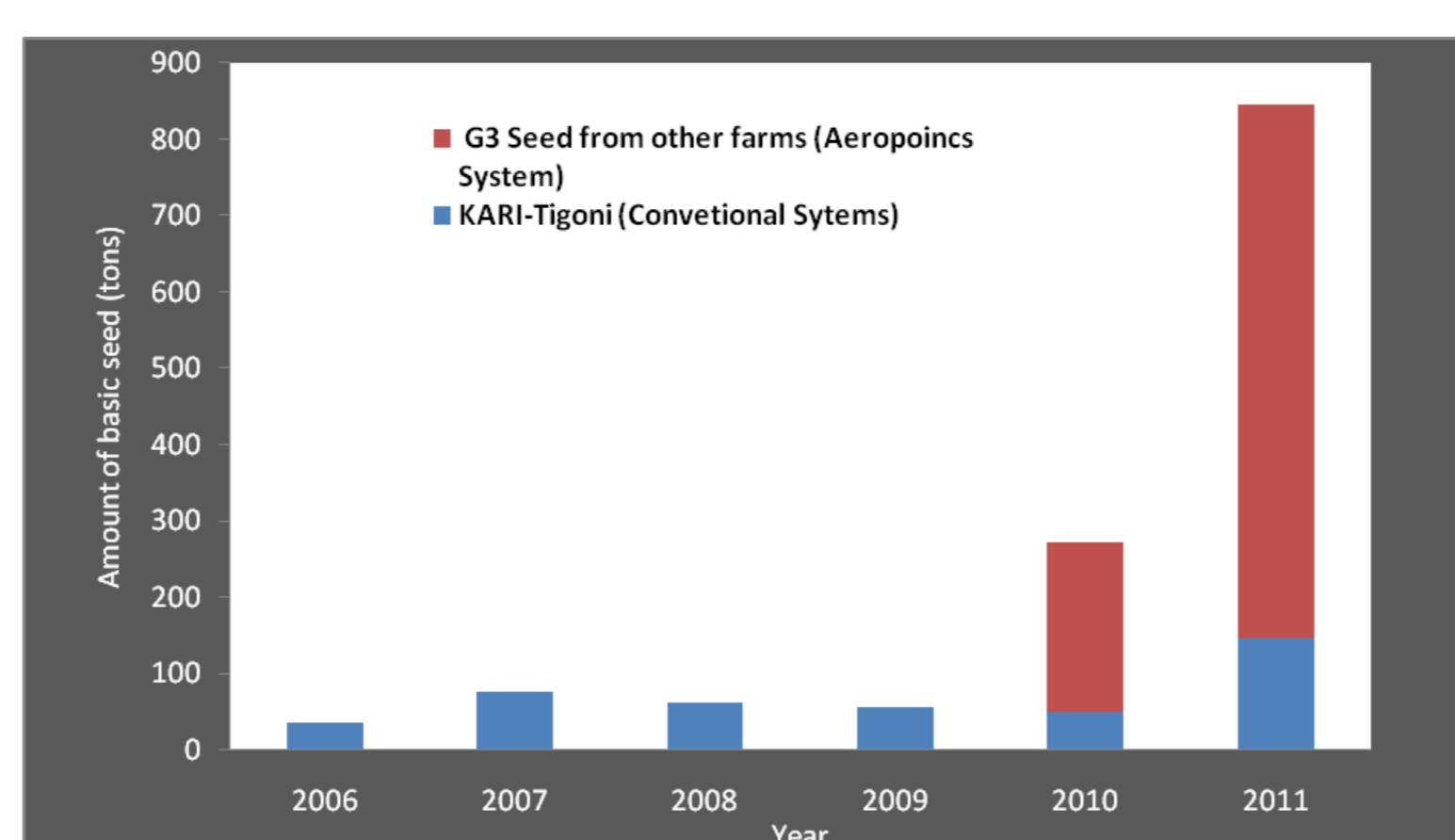
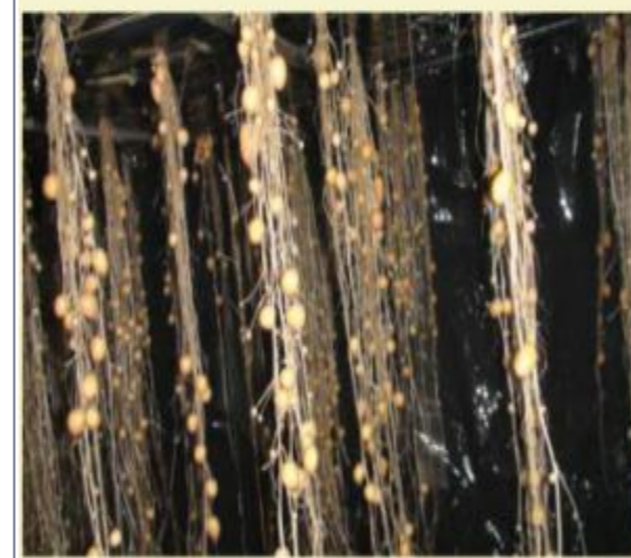


Figure 4. Production trend of Basic Potato seed in Kenya from 2006-2009

The "3 G" seed strategy

THE 3G SEED STRATEGY relies on producing large numbers of minitubers through one generation of a very rapid multiplication technology (RMT), allowing bulking of sufficient seed in only two field generations rather than the conventional four to six. This reduces both the cost of production and prevents the build up of damaging diseases in the field.



The main RMT method is **aeroponics**, which achieves multiplication rates of over 50:1 compared with the normal 5:1.

Aeroponics involves producing minitubers from in-vitro cuttings in a totally enclosed darkened box in which water and nutrient are sprayed as a mist. Minitubers are harvested from the suspended roots. CIP has adapted this technology in Peru to lower its cost by reducing the cost of components and saving on water and energy usage.

So far, 11 aeroponics units have been established and produced 1.4 million minitubers in Kenya alone. Economic analysis showed that minitubers in aeroponics can be produced for about 20-50% of the cost of minitubers from conventional pot production systems.

Other Key Lessons Learned from the 3G Project

- Aeroponics and other RMT can contribute to breaking the seed potato bottleneck by reducing the number of field generations of multiplication needed to get quality seed to farmers.
- Clean seed is a profitable investment for smallholder farmers, and farmers are willing to invest in certified seed.
- An efficient, agile, innovative private sector will invest in seed potato production.
- Transport of bulky seed potato is a major challenge, underscoring the importance of decentralized seed multiplication.
- With proper technical advice and backstopping, farmers are able to produce high-quality seed locally.
- How short-generation seed schemes relate to existing seed regulations and need to standardize across borders needs to be better understood.
- Seed movement and harmonization of variety registration/recognition across borders in the region are still not implemented.

Benefits of using high quality potato seed

As result of project interventions and in particular improved accessibility to quality seed and capacity building, farmers have witnessed an increase in their production. From their experimental plots where farmers compared farmer practice (FP) seed (unselected) with the positive selected (PS) and 3G seed potatoes. Farmers observed improved plant vigor, less number of plants affected by BW and viruses, and a yield increase of 84 and 180 % with PS and 3G seed, respectively. (Fig.5).

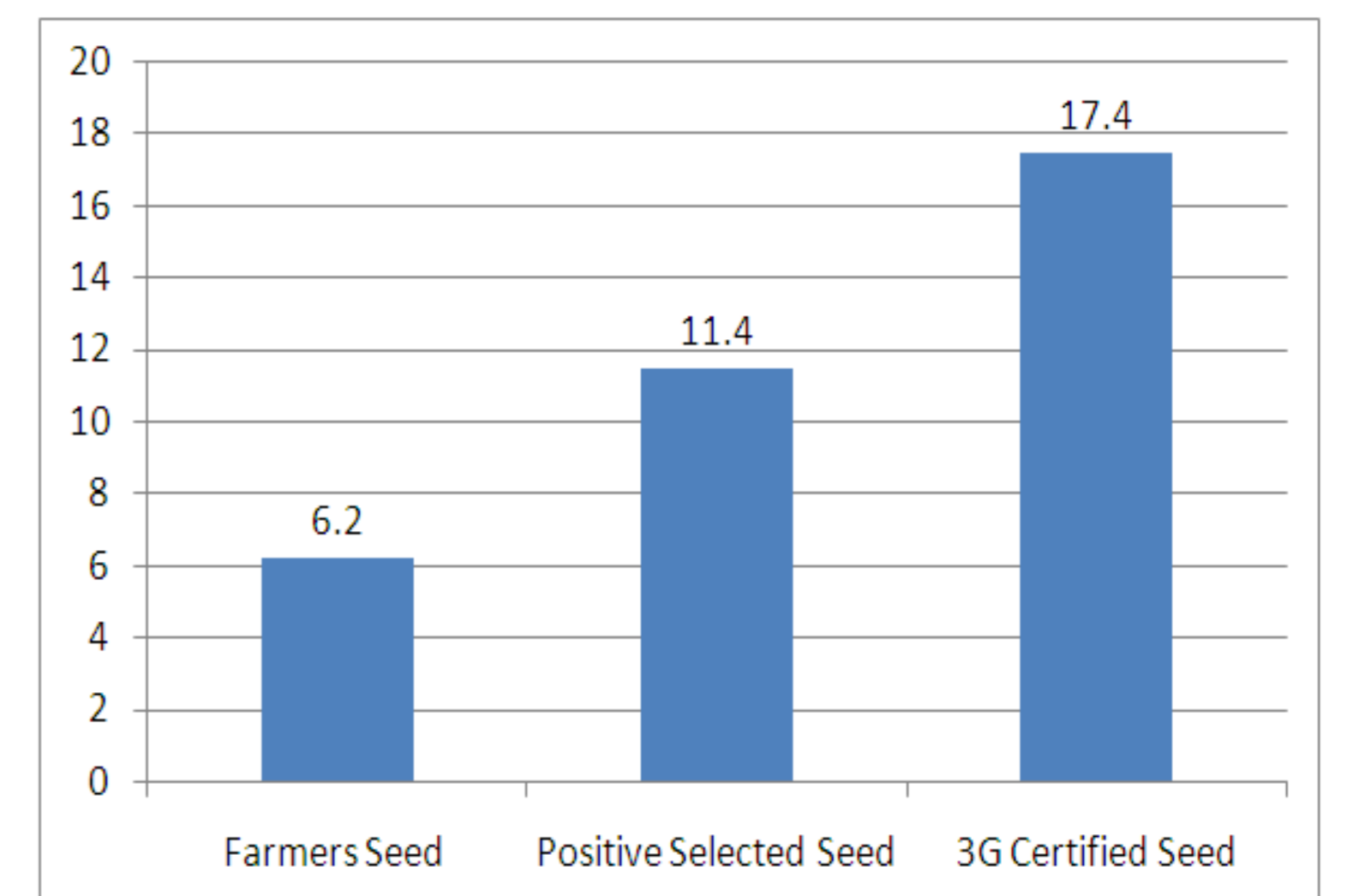


Figure 5. Average yields (t*ha⁻¹) of different seed qualities experimented with 101 FGs in Kenya.

To evaluate the combined effects of seed quality and plant nutrition, fertilizer levels of 0, 45 and 90 kg*ha⁻¹ N: P: K were applied to G3 and FP seed at eight sites. Tuber yields increased with increasing fertilizer levels with both seed qualities. The G3 seed yielded 4.3 t*ha⁻¹ higher with no fertilizer than FP seed with 90 kg N: P: K *ha⁻¹, underscoring the importance of seed quality (Fig. 6).

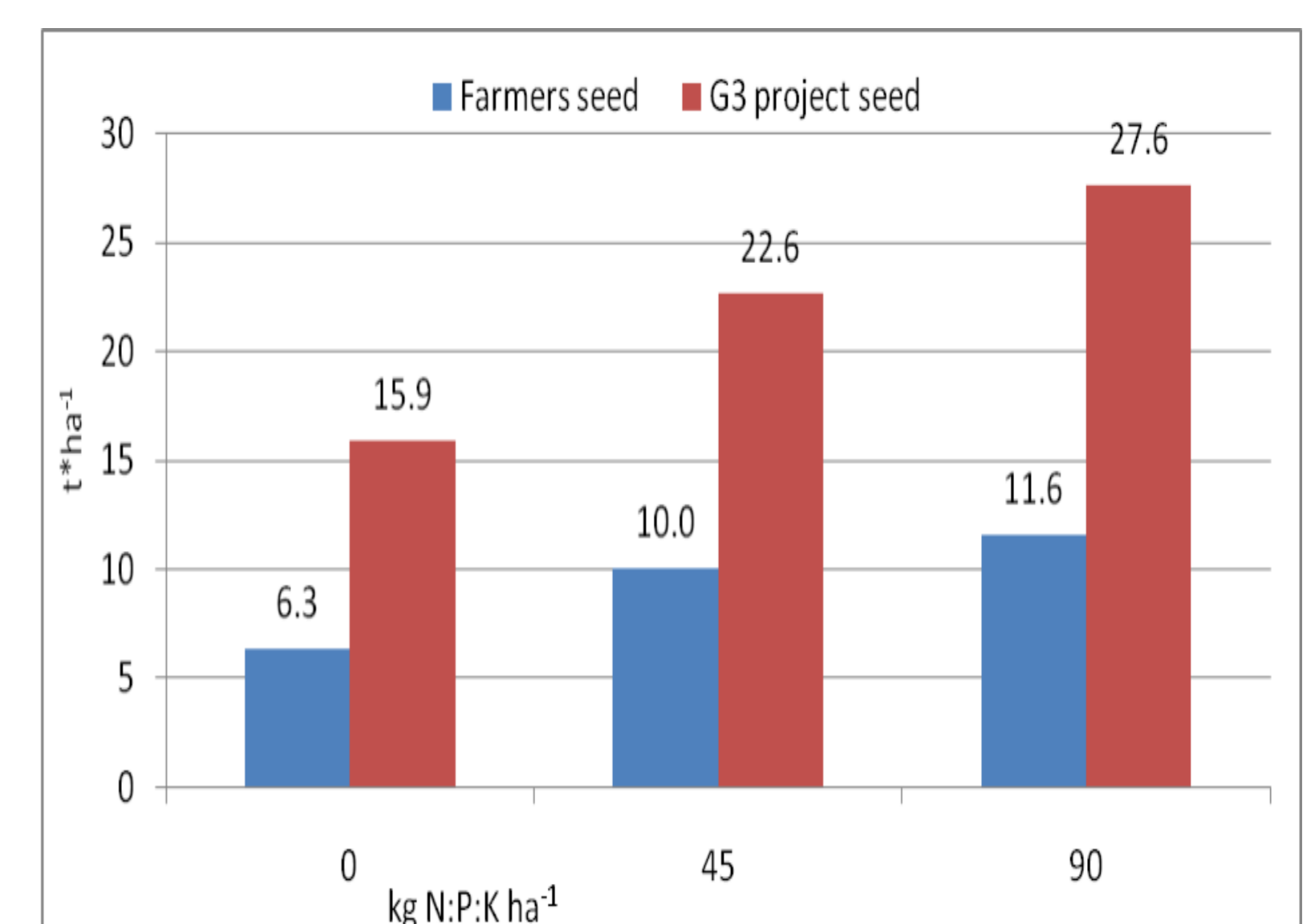


Figure 6. Average yields (t*ha⁻¹) of different seed qualities experimented with 101 FGs in Kenya.

Conclusion

Seed quality plays a pivotal role in the improving the paltry yields of potatoes in Eastern Africa. To overcome the supply crisis of high quality seed serious investment has to be done in seed sector. The "3G" approach involved private sector actors for making available seed to farmers in three generations instead of the usual seven or more provided one of the best opportunities to exploit the contribution of the potato to improving livelihoods.

Acknowledgement

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