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Research Application Summary

Enhancing productivity and incomes of the potato value chain in Uganda

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Abstract

This paper provides highlights of an on-going community/farmer participartory approach to strengthen potato productivity and value chain in south western Uganda. The approach intergrates graduate students, research and TVET students. Work done so far indicates that productivity can be increased significantly but more work on value addition is needed.

Key words: Crop intensification, intercropping, seed potato, *Solanum tuberosum,* south western Uganda

Résumé

Cet article présente les points saillants d'une approche participative des communautés/agriculteurs en cours pour renforcer la productivité et la chaîne de valeur de la pomme de terre dans le sud-ouest de l'Ouganda. L'approche intègre des étudiants diplômés, des chercheurs et des étudiants de l'EFTP. Le travail effectué jusqu'à présent indique que la productivité peut être augmentée de manière significative, mais un travail supplémentaire sur la valeur ajoutée est nécessaire.

Mots clés : Intensification des cultures, culture intercalaire, pomme de terre de semence, S*olanum tuberosum*, sud-ouest de l'Ouganda.

Background

In spite of its growing importance as a food and cash crop for many households and the much attention researchers, government and non-government organizations have invested in it, the potato (*Solanum tuberosum)* sub-sector in Uganda remains challenged at all levels of its value chain. Productivity is much lower (7.5 t ha^{-1}) than the potential (20 t ha^{-1}) reportedly to be achievable

on research station (Byarugaba *et al*., 2017). Many studies have attributed the low and declining productivity to limited availability and use of quality seed (Janssens *et al*., 2013; Karanja *et al*., 2014; Aheisibwe *et al*., 2015; Okello *et al*., 2017). Because clean seed if available is expensive, farmers use recycled seed from the previous seasons. This leads to accumulation of seed borne diseases in the farm-saved seed which is often used for several cropping seasons, resulting into seed quality degeneration and poor yields (Gildemacher *et al*., 2007).

The potato sector is also characterized by poor harvesting techniques, storage facilities, packaging and marketing systems which result into high postharvest losses (Kiaya, 2014). For instance, Misener *et al*. (1989) identified mechanical injury as the most significant parameter affecting the marketability of potato, while Kyomugisha *et al*. (2017) reported limited value addition to potato as a barrier to increase production. Sebatta *et al*. (2015) reported that value addition to both ware and seed potato was profitable, with farmers adding value earning 40% more than those who did not.

Furthermore, scarcity of other farm resources especially land also pose a challenge. In the main potato growing areas of Uganda, arable land is very small yet farmers grow a wide range of crops which compete for the land. In such a situation, it becomes crucial to improve land use efficiency through intensification. However, most research on potato in Uganda has looked at the crop as though it is only grown as a monocrop and in isolation of other crops, yet in reality many farmers intercrop potato with other crops. This implies that the research has not benefited those farmers, and this partly explains why adoption of some research recommendations has remained low (Mwanja *et al*., 2016).

Project focus and implementation

Some of these challenges can be avoided or minimized, but it requires multi-stakeholder approaches. A community-based platform system is seen as one alternative that can increase availability, accessibility and affordability of quality seed as option for formal seed system. This project therefore focuses on (i) the seed potato value chain, (ii) crop- intensification production system, (iii) value addition, (iv) market linkages to reduce market inefficiencies and increase access to markets, and (v) capacity building for both young scientists and farmers. The project aims at identifying and promoting solutions on how best quality seed potato can be made more available and accessible by farmers, how potato farmers can practice a sustainable crop intensification production that maximises the benefits (productivity, food and income) from potato and the other crops given the limited farm resources, and how the value of potato can be improved through processing and marketing for increased benefits to farmers and consumers. This way the project will have contributed to the First, Second and Third Sustainable Development Goals (SDGs) through reduced hunger, poverty, and improved wellbeing of the people through good nutrition. Reduction in these challenges will enhance productivity, profitability and equity in the potato value chains, which is in line with the Uganda National Agricultural Policy. This forms the basis of an ongoing project which aims at enhancing potato productivity and incomes of the potato value chain in Uganda, specifically in south west Uganda.

Target group

The project targets ware and seed potato farmers, farmer groups, processors, researchers, and consumers. Because of its focus and scope, the project team constitutes of staff and organisations with multidisciplinary backgrounds including academia and researchers at University, Research and Extension organisations, Community-Based Organisation, a potato processing and business

incubator, graduate and undergraduate students, a private sector, and TVET students and Instructors. The project, therefore, strengthens the synergies and working relationships of the University, Community-Based Organisations and Associations, Research Institutions and an Agricultural College that trains Mid-level Cadres in Uganda in areas of agriculture, agribusiness and human nutrition.

Project description

The project is being implemented in Kabale, Rubanda, Rukiga and Mbarara districts in South-western Uganda, a region popular for potato production but characterised by land scarcity, decreasing agricultural productivity, high postharvest losses and low per-capita income. The first phase of the project involved recruitment of Graduate students (3 MSc and one PhD) and 25 Diploma students of a TVET, Bukalasa Agricultural College; mobilising farmers and community associates; and conducting an exploratory study. The second phase included (i) establishing researcher-led field experiments alongside farmer-managed demonstrations as modalities to demonstrate the importance of quality seed, and potato intensification production system; (ii) screening potato varieties and determining their physical and chemical characteristics for value addition and processing, and (iii) establishing a potato screen house for quality seed multiplication. Along the potato growing seasons, farmer trainings were conducted covering aspects of seed source and seed selection, land use and agronomy, postharvest handling, value addition, and marketing.

Project outputs

Community engagement. The communities in the districts where activities have been implemented were successfully mobilised and engaged. These communities include farmers and farmer groups, and church (Diocese of Kigezi). Their involvement included offering land where experiments, farmer demonstrations and screen house were set up, and participation in project activities. Alongside the filed experiments in four sites which have been run for two consecutive seasons were farmer-managed demonstration gardens where a total of 160 farmers have participated. Besides, two farmer training rounds were conducted in three sites (a total of 6 trainings) attracting a total of 350 participants including mainly farmers and secondary school students. The centrality of the project sites has attracted different categories of stakeholders including the King of Tooro, His Highness Oyo Nyimba Kabamba, the Prime Minister, Rt. Hon. Ruhakana Rugunda and the State Minister of Finance for Planning, Hon. David Bahati, and regional leaders of Operation Wealth Creation, who pledged to support the project.

Student involvement. Three MSc. Students (two females in Crop Science and one male in Food Science and Technology) and one male PhD student (in Agricultural and Rural Innovations) have progressed well with coursework and research. They have been key actors in most of the project activities including setting up and running field experiments, data collection and training farmers. In addition, three BSc. Intern students (two females) and 25 TVET students (10 females) have participated in the project, and another group of 25 has been recruited.

Research results. From a farmer-researcher managed experiments to determine the effect of seed sources, seed size and seed dressing on potato performance and yields, results show that farmer-saved seed had a slower and lower gemination rate, while seed from the Research Institute (KAZARDI) grew more vigorously. Small size seed had the least number of plants reaching physiological maturity compared to large size seed. The yield obtained from KAZARDI seed was the highest with more marketable size tubers followed by seed from local market. Farmer-saved seed yielded more tiny non-marketable tubers, a high number of diseased tubers and of mixed

varieties. Generally, small-size seed tubers produced more tiny tubers, while the large-size seed perfomed better with more marketable yield.
Preliminary results from the farmer-researcher managed experiments on crop intensification show that yields from ridged plots were higher with mainly large-size tubers than from flat beds which yielded mainly small-size tubers. However, plant spacing differences of 75cm x 30cm and 60m x 50cm) did not yield differently. Farmers' practice (40m x 30cm) performed poorly. In terms of cropping ratios, the ratio of 1 row of potato: 1 row of beans performed best, while 2 rows of potato: 2 rows of beans performed poorest in all agronomic parameters. Potato mono-cropping (1 row of potato: 0 row of beans) gave good yields but with high disease and insect severity and incidence.

The value addition study has established the physical and chemical properties for producing French fries. Results show that while most of the potato varieties grown in Uganda have high dry matter content (20-30%), the tubers are usually small in size, round in shape and contain high levels of reducing sugars exceeding the recommended 0.25% is not suitable for processing into French fries.

Conclusions and recommendations

The use of quality seed in potato production cannot be overemphasised. As such effort is ongoing in our project through the use of community/farmer participatory approach to enhance adoption of clean potato seed production and other good practices that enhances potato productivity and value addition. The system of crop intensification has proven to increase potato yields, and if adopted would increase land use efficiency and potato productivity. However, more research is needed to develop and optimize potato intensification practices for other potato companion crops and other potato intensification components. Regarding value addition, potato varieties grown in Uganda have good physical and chemical characteristics for processing, but some are not suitable for French fries production. The varieties with superior traits for processing should be identified and promoted. Besides, economic viability of the processed potato products and stability of their markets should be investigated.

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