Production and Genetic Conservation of Quality Protein Maize (QPM) Seeds by Smallholder Farmers in Karamoja Sub-Region, Uganda

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Abstract

The need for improving availability and access to pure quality maize seeds of protein content by small holder farmers instigated the commencement of a scheme for production and conservation of longe5 seeds in the dry land farming system. Longe5 is a maize variety with two amino acids called *tryptophan* and *lucine* coding protein synthesis. This study aimed at: creating a multi stakeholder innovation platform for commercial production of pure quality Longe5 maize seeds; equipping farmers with sustainable knowledge of production, preservation and quality control of Longe5 maize seeds; increasing seed volume through farmer–farmer block production. Methodically, four seed grower groups were formed and commenced seed production using longe5 foundation seed stock for three seasons through half-sib pollination technique. Comparatively QPM seed scheme were established, functionalized with contract agreements for commercial production developed and operationalized; model for seed profit margin analysis developed; and 60% of seed growers trained in production, conservation, marketing and consumption of QPM maize; 79.9% of farmers adopted and applied half-sib method for genetic purity conservation. 100MT of pure QPM maize seeds were produced. Currently growers are knowledgeable of the values, benefits of longe5 seed production with its access and availability

Introduction

Production of maize (Zea mays) is important and better when yield is high and food products are nutritive to consumers. Increasing maize productivity is based on sustainable use of pure quality seeds. In Uganda longe5 maize variety is preferred for containing amino acids (Tryptophan and Lycine) that codes protein synthesis in maize grains. Yield is good under ideal production environment and can be better if smallholder farmers genetically conserve seeds during production for ease of access especially at planting time. Therefore production and conservation of seed purity is ideal to enhancing food availability to increasing population for better livelihood.

Study Objectives

This study aimed at:

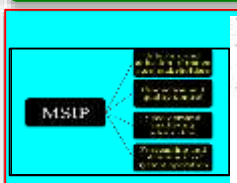
- Creating a multi stakeholder innovation platform for commercial production of pure quality Longe5 maize seeds
- Training and equipping farmers with practical knowledge for seed growing and preservation of purity and protein
- Quality control and marketing of pure quality Longe5 seeds in a sustainable venture
- Increasing longe5 seed availability through farmer–farmer block production.

Materials & Methods

Successes were achieved through formation of 4 seed grower groups each with 30 smallholder farmers (50% gender) and commenced seed production using foundation longe5 maize seed stock for 3 seasons. Selected plants were bulked and applied **half-sib** pollination technique for enhancing pure quality and protein seeds conservation. The perspective applied included:

- ✓ Functional platform establishment for sourcing QPM seeds production and marketing information (**Adekunle *et. al.* 2014**)
- ✓ Introduction and production of seeds using farmer field school (FFS) perspective for practical grower training (**Braun *et. al.*, 2000**)
- ✓ Seed fields isolation by distance and time of planting for genetic purity conservation (**MacRobert J.F., 2009**)
- ✓ Establishing block fields for seed production.

Results



Tab.1: Showing number of farmers trained and produced pure QPM maize seeds in Karamoja, Uganda

Season	Farmer Trained	Cropping Years 2017	2016	2015
A	200	169 (84.5)	30 (15.0)	10 (5.0)
B	90	70 (77.8)	10 (11.1)	10 (11.1)
A	120	90 (75.0)	20 (16.7)	10 (8.3)
B	75	50 (66.7)	15 (20.0)	10 (13.3)
A	240	205 (85.4)	25 (10.4)	10 (4.2)
B	86	61 (70.9)	15 (17.4)	10 (11.6)
A	268	238 (88.8)	20 (7.5)	10 (3.7)
B	90	60 (66.7)	20 (22.2)	10 (11.1)
Total	1169	934 (79.9)	366 (31.3)	325 (27.8)

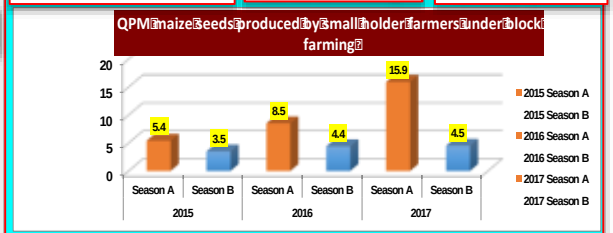
Multi Stakeholder Innovation Platform was established with 4 pillars for QPM productivity and commercialization

Small farmers trained in production of QPM seeds for access and availability at planting time and marketing for an income to improve family livelihood

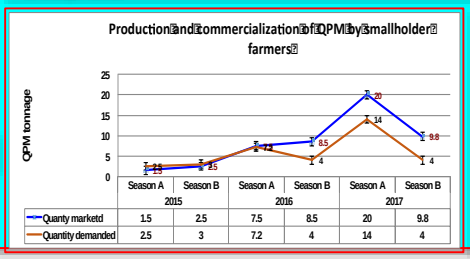
Farmers discussion about QPM technology during production

Farmer conserves maize genetic purity with half sib technology

QPM performance under smallholder farmer management



QPM productivity potential by smallholder farmers during project with seasonal variations due to drought stress



	2015 Season A	2015 Season B	2016 Season A	2016 Season B	2017 Season A	2017 Season B
Quanty marketd	1.5	2.5	7.5	8.5	20	9.8
Quantity demanded	2.5	3	7.2	4	14	4

QPM seed production guided with farmer training thus creating high demand for seeds among smallholder farmers

Discussion of Results

Using the integrated Agricultural Research for Development (IAR4D) approach, MSIP was established with functional structures for planning seed system operations as identified by Adekunle *et.al.* (2014). The various portfolios Identified or MSIPs operation included Seed Companies, Farmers, Seed inspector and Research. The platform identified lack of quality seeds of maize and production knowledge as cardinal problems in improving productivity of maize. Farmer training concentrated on grower practical learning of production field siting and preparation, seed sowing using dribble method, nutrient (Urea 46%N) application, variety descriptions and plant structure and weeding methods timing at respective crop growth stages for ensuring proper growth of pollinated plants. At least 4farmer field schools (FFS) were formed and 79.9%. Growers used the same knowledge to identify off types prior to flowering, de-tassled and or rogued to maintain the genetic purity of same maize variety. The success of this technology enhanced growers to own implement the half sib technology where 98% of pollinated plants produced pure quality seeds hence preferred as quality declared seed (QDS). Similarly maize fields isolated at 400m from other maize plots were found uniform in tassel and silk structural appearance hence conformation of morphological plant purity, and harvested cobs appeared uniform hence purity assurance. The achieved results of genetic purity were in correlation with observation of MacRobert (2009) on maintaining and production of breeder seed of self-pollinated maize crops. Thus maize seeds produced under block farming system (Fig. 3) exhibited purity with 80% of longe5 seed variety highly demanded by agro-stakeholders

Recommendation

Pure QPM Production and genetic conservation are vital in the maize production system for ease of seed access and availability to the farmers. But sustainability of the venture will further need consideration of the following aspects for legalization and success as a business venture.

- ✧ Seed legislation
- ✧ Seed business registration
- ✧ Grain product development and marketing for smallholder farmer income.
- ✧ Knowledge of grain nutritive development,
- ✧ Development of a comprehensive seed system for the region

Conclusion

Prior to start of this study;

- **Farmers lacked knowledge between seeds & food grains since grains were used both for food & growing new crops.**
- **Lacked knowledge of quality protein content in maize**
- **Lacked knowledge of accessing seeds & the production sys.**

Currently:

- ✓ **Farmers are aware of difference between seeds and food grains production and seeds sources.**
- ✓ **Farmers are aware of the Values (seed avail.,) & Benefits (good yield, income & food) of growing seeds.**
- ✓ **Farmers feel appraised and own the technology for increasing productivity and consumption of nutritive foods.**

References

- **Adekunle *et. al.*, 2014**: Approaches for Setting-up MSIPS for Agricultural Research and Development:
- **Braun *et. al.*, 2000**: Farmer field school & local agricultural research committees; complementary platforms for integrated decision-making in sustainable agriculture.
- **MacRobert J.F. (2009)** Seed business management in Africa; Harare, Zimbabwe,
- **Maize Program (1999)** Development, maintenance, and seed multiplication of open-pollinated maize varieties

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