Multi-stress tolerant bean varieties in Uganda

Source	FAO, Le Groupe-Conseil Baastel, Global Climate Change Alliance
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Sustainbale Development Goals	No poverty, zero hunger, decent work and economic growth and life on the land

Summary

This technology describes the testing of multi-stress tolerant bean varieties in the central cattle corridor of Uganda, a region, particularly exposed to dry spells. The benefits and constraints compared to local varieties are shown in a cost-benefit analysis.

Description

This good practice describes the benefits of the cultivation of multi-stress tolerant bean varieties in Uganda, compared to local traditional varieties. Beans are an important staple crop in the central cattle corridor of Uganda. An increase in yields and production quantities due to enhanced resilience to extreme events would strengthen food security among vulnerable smallholder households. Beans are grown in a lot of districts in Uganda with either local or improved varieties. The most common improved bean varieties grown in the visited communities are the Nabe series (in the validation of this practice, the focus lies on Nabe 4, 15 and 17 which are displayed in table 1). The traditional system uses local seeds, especially yellow beans and kanyebwa, costing between 1 500 and 2 000 UGX/kg. Their yield varies between 150 and 500 kg/acre.

The aim of using higher yielding varieties is to absorb the impact of a potential decline in yields that is likely to occur under climate change. Of course the higher yielding varieties are beneficial even without climate change and their adoption may be justified on cost-benefit grounds but the expectation

Table 1: Technical specifications on beans improved varieties

Variety	Maturity (days)	Description	Yields (ton/acre)	Spacing
Nabe 4	80-95	Large red mottled seed. Resistance to major bean diseases. Tolerates low soil fertility.	0.8 - 1	30 cm x 30 cm chop and plan 50 cm x 10 cm row planting 60 cm x 20 cm Seed rate: 20-30kg/acre
Nabe 15	60-70	Medium seed, tolerant to bean anthracnose and suitable for all regions. Tasty and swells while cooking.	0.8 - 1	
Nabe 17	58-78	The seeds are medium in size and red mottled. Rows well in low to mid altitude areas. Tolerant to anthracnose, angular leaf spot, common bacterial blight, Rust and Bean common mosaic.	0.8-1	Spacing: 5 cm x 30 cm (1 seed/hole) or 10 cm x 60 cm (2 seeds /hole) Seed rate: 20 – 25 kg/acre

Source: FAO/TECA

is that the case becomes stronger with climate change. There are also some benefits from switching to some of the higher yielding varieties as they are more resistant to viruses and bean rot, which are expected to increase with climate change.

1. Technical specifications on the Nabe 4, Nabe 15 and Nabe 17 improved varieties

The technical specifications on the Nabe 4, Nabe 15 and Nabe 17 improved varieties are displayed in table 1.

2. Major costs and resources needed to cultivate improved beans seeds

2.1 Seed Purchase Price

Improved beans seed can be bought on the market at a price between 4 000 and 4 800 UGX/kg. According to the visited communities, beans are sold in the market at 1 200 to 2 500 UGX/kg. The longer beans are stored, the higher their market price will be.

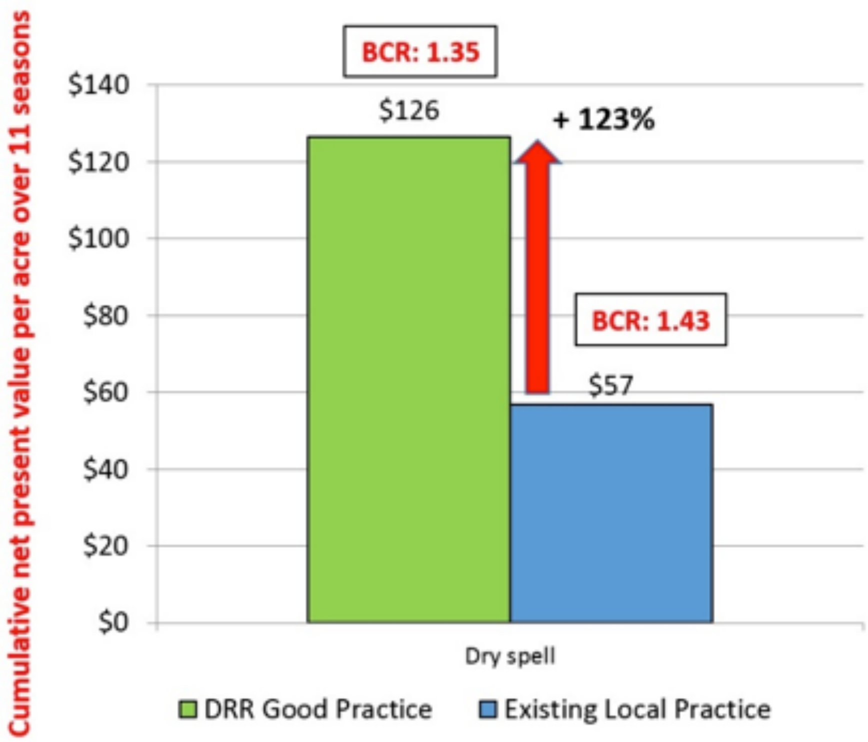
As mentioned above, improved beans seeds are sold in the market at a price between 4 000 and 4 800 UGX/kg, but seeds are usually saved from one cropping cycle to the other. Farmers plant between 20 kg and 30 kg of beans per acre.

3. Cost-Benefit Analysis of the Practice

The results of the qualitative and quantitative analyses conducted based on field demonstration data are summarized hereafter.

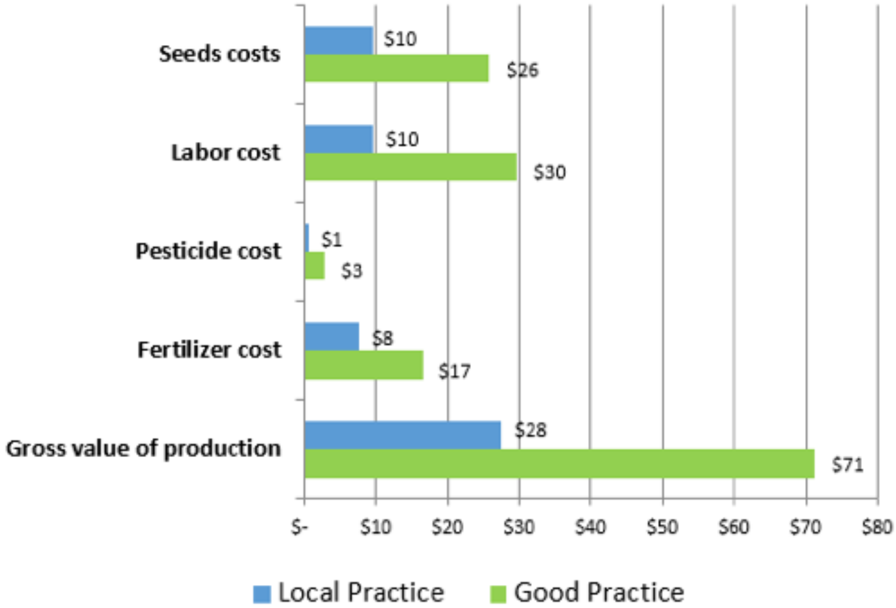
The Cost-Benefit Analyses was conducted based on quantitative data collected during the monitoring period in the 2016 dry season (Jun-Aug). Data collected from good practice plots were compared with data collected from control plots within the same farms.

Figure 1. Cumulative Net Benefits and Benefit Cost Ratios of Good Practice and Local Practice (USD per acre per season) - 2016 Dry Season (Jun-Aug)



Source: FAO/TECA

Figure 2. Average costs and benefits (USD per acre)



Source: FAO/TECA

3.1 Good Practice

Multi-stress tolerant bean varieties (Nabe 15, Nabe 17)

3.2 Local practice

Local bean varieties (yellow bean, Kanyebwa).

3.3 Sample

3.3.1 Drought

16 farms in Kiboga (5) and Mubende (2) and Sembabule (9) districts.

3.3.2 Normal Conditions

One farm (not included in the analysis).

The graph in Figure 1 shows that, in dry spell conditions, the net benefit over 11 years is 123 percent higher in farms that adopt the multi-stress tolerant bean varieties, as compared to non-adopters. The cost-benefit ratio of the good practice is 1.35, which is higher compared to 1.43 of the existing local practice. This is because the good practice requires more input and labour. However, the increase in the yield due to the improved varieties' resilience to drought and diseases more than compensated the additional input cost.

Figure 2 shows the costs of the good practice compared to the local practice.

Cost assumptions are as follows:

- Labour cost only includes hired labour while family labour is not included.
- Seeds costs are considered as upfront capital costs, not seasonal costs (first purchase, then saved from cycle to cycle).
- Operation and maintenance costs are not included due to possible double counting with other costs such as labour.

Figure 2 shows that, in the analysed dry spell scenario, Longe 5 and Longe 7 H are the varieties that bring higher net returns, followed by MM3, Longe 4 and Longe 10 H. The local variety Munandi brings the lowest net benefits. The best performing variety (Longe 5) brings net returns almost three times higher than the local variety.

3.4 Co-benefits

The multi-stress tolerant bean varieties also mature faster than the local variety. Therefore, water use is lower under the good practice.

3.5 Added benefits

Added benefits under non-hazard conditions could not be analysed since all farms were affected by dry spell.

3.6 Avoided losses

In farms affected by dry spells, the net benefit of the good practice was more than double the net benefit of the local practice. This was largely due to enhanced drought resilience of the improved variety.

4. Effectiveness and benefits

4.1 Climate Change Adaptation related benefits

The Nabe series is more resistant to droughts and is therefore adapted to face unreliable rains and rainfall variability induced by climate change.

4.2 Socio-economic and ecological benefits

Improved bean varieties, if sustainably managed, can increase yields up to 1 t/acre. In dry spell conditions, improved varieties yield can be more than two times higher than the yield of local varieties.

The Nabe series is more resistant to drought, and to some diseases such as the Anthracnose and the Bean Common Mosaic Virus. A wide range of bean varieties exist, with specific characteristics. Farmers can choose the variety according to the environment they will grow them in, and to their own objective (food, export, etc.) and taste.

4.3. Synergies with other crops

Some farmers reported that beans perform better when intercropped with bananas, since they can benefit from the mulching and manure applied for the bananas. Beans also benefit the bananas since they are a nitrogen fixing plant. Intercropping can reduce the costs of labour and increase synergies between crops, resulting in higher yields.

5. General recommendations

Beans are usually used for both food and cash. The price increases when communities store the beans and sell them later during the low season. The installation of metallic and plastic silos can be a good investment to store the harvest.

6. Validation of the practice

6.1 Geographical area of practice validation

The practice was validated in the central cattle corridor of Uganda in 16 farms in the Kiboga (4), Mubende (1), Nakasongola (10), and Nakaseke (1) districts.

6.2 Context of implementation

As part of the Global Climate Change Alliance (GCCA) project on Agriculture Adaptation to Climate Change in Uganda, farmers were introduced to multi-stress tolerant bean varieties (NABE 15 and Nabe 17) and were trained on a set of good practices to enhance the resilience of bean production to increasing dry spells. The Nabe series is especially resistant to drought and to diseases such as the Anthracnose and the Bean Common Mosaic Virus.

6.2.1 Environmental and climatic (period/season) context

During the 2016 dry season (June to August), the performance of this good practice was monitored in 16 farms in the aforementioned districts. All the farms were affected by dry spells during the monitoring period. In particular, rainfall was between 50 to 100 percent below normal in August, and land surface temperatures were 3 to 7 °C above average, causing a reduction in water availability.

6.2.2 Social - target group

Smallholder farmers.

6.3 Farmer's perceptions

6.3.1 Sustainability

Two farmers were interviewed for the evaluation of the good practice. Both farmers responded that they would like to replicate this good practice in the next seasons as it was more productive, profitable and resistant to climate constraints such as drought, dry spell and delay in rainy season.

6.3.2 Socio-economic benefits

Both farmers said all family members benefited from the good practice although more labour was put in than the local practice.

6.3.3 Marketing

Two farmers requested support in marketing the new variety beans.

7. Minimum requirements for the successful implementation of the practice

7.1 Major costs are

Price of different bean varieties are mentioned in section 2.1.

7.2 Major barriers are

Compared to the local practice, more labour input is required. No major additional barriers were identified except the price of improved seeds.

8. Agro-ecological zones

- Tropics, warm

9. Related/Associated Technologies

Other adaptation options that would create the most synergies with improved varieties are:

- Cover crops;
- minimum tillage;
- organic fertilizers; and
- mulching.

10. Objectives fulfilled by the project

- Pro-poor technology