Measuring the return on investment into agricultural technologies for disaster risk reduction: rice cultivation with guano fertilizer – Lao PDR

Summary

This technology describes the outcomes of a Cost-Benefit Analysis on rice cultivation with guano fertilizer that was conducted based on quantitative data collected during a monitoring period in both the 2015 wet season and the 2016 dry season.

Description

The application of guano fertilizer in paddy fields was introduced as a DRR good practice technology as part of the project Consolidating capacities for DRR in Agriculture in South East Asia. Guano fertilizer helps keeping soil moisture and improves soil fertility, thereby reducing rice production losses faced by farmers in case of delayed rainy seasons, dry spells or other shocks.

The performance of this DRR good practice technology was monitored in 24 farms in Savannakhet (15) and Khammouane (9) Provinces during the 2015 wet season, when all farms experienced dry spells and/or delays in the rainy season during the monitoring period. During the dry season, 12 farms were monitored in Savannakhet Province, out of which eight farms experienced cold wave, and the remaining four did not experience any hazard during the monitoring period.

The following paragraphs summarize the results of the qualitative and quantitative analyses conducted based on field demonstration data.

1. Cost-benefit analysis

Cost-Benefit Analyses were conducted based on quantitative data collected during the monitoring period in both the 2015 wet season (see Figure 1) and the 2016 dry season (see Figure 2).

The CBA calculates the cumulative net benefits obtained from 1 hectare of rice over a period of 11 years (10 percent discount rate), as well as the benefit-cost ratio (BCR), which is the ratio between total discounted benefits and total discounted costs over the appraisal period.

1.1 Results from the wet season (Figure 1)

- Benefits from rice cultivation with guano fertilizer are about 78 percent higher in farms affected by dry spells and delayed rains, as compared to the control plots where
rice is cultivated without applying guano fertilizer.

- The BCR of growing rice with guano fertilizer (1.5) is larger than the BCR of usual rice cultivation practices (1.28). This means that investing in the adoption of the good practice brings higher returns than investing in previous rice cultivation methods.

Figure 1. Cumulative Net Benefits and Benefit Cost Ratios of DRR Good Practice and Local Practice (USD per hectare), 2015 Wet Season

Source: FAO 2017

1.2 Results from the dry season (Figure 2)

Negligible differences are observed between net benefits and BCR from DRR good practice plots and from control plots during the dry season, when all monitored rice fields were irrigated. This is true for farms affected by cold waves, as well as for farms that were not affected by hazards during the season. Interestingly, a significant absolute increase in net benefits is observed in the dry season, as compared to the wet season. This could be due to a number of factors, including:

- the delay in the 2015 rainy season, which caused extensive rice production losses;
- lower labour costs in dry season due to high offer and low demand;
- better rice varieties were introduced in the dry season;
- more careful and dedicated management in dry season due to less activities in the farms.

Figure 2. Cumulative Net Benefits and Benefit Cost Ratios of DRR Good Practice and Local Practice (USD per hectare), 2015 Dry Season

Source: FAO 2017

2. Validation of the practice

2.1 Geographical area of practice validation

The performance of this DRR good practice technology was monitored in 24 farms in Savannakhet (15) and Khammouane (9) Provinces during the 2015 wet season, when all farms experienced dry spells and/or delays in the rainy season during the monitoring period. During the dry season, 12 farms were monitored in Savannakhet Province, out of which eight farms experienced cold wave, and the remaining four did not experience any hazard during the monitoring period.

2.2 Farmers’ reactions

97 percent of farmers found that applying guano fertilizer led to an increase in crop production, and assigned a score of 4.8 out
of 5 to the performance of this DRR good practice technology in the face of hazards such as dry spells, delays in the rainy season and cold waves. Several farmers highlighted the positive effect of guano fertilizer on soil quality and soil moisture (e.g., “soil became muddy”), including as result of a reduction in the use of chemical fertilizers. More than half of the farmers interviewed noted a positive impact of this DRR good practice technology on the resistance of rice to climate constraints, especially in farms affected by cold waves during the dry season. Finally, all farmers interviewed after the dry season stressed that their seasonal income increased due to the improvements achieved through the implementation of the DRR good practice technology.

On the other hand, some farmers faced difficulties in finding guano in local markets; if not addressed, this challenge may limit the replicability and upscaling of this DRR good practice technology. Furthermore, several farmers stressed the need for additional training on a number of subjects, including soil management practices, self-production of organic fertilizer, and rice cultivation in general.

2.3 Added benefits
Under non-hazard conditions, the data reveals that the DRR good practice does not bring additional economic benefits. This result is based on a reduced sample and should be confirmed with additional analysis.

2.4 Avoided losses
In small farms affected by dry spells or delays in rainy season, rice production losses are reduced by 78 percent, or about USD 86 per hectare per season. On the other hand, avoided losses in case of cold waves are negligible during the dry season.

3. Agro-ecological zones
• Tropics, warm

4. Objectives fulfilled by the project
4.1 Resource use efficiency
The application of guano fertilizer allows a reduction in the use of chemical fertilizers, and consequent improvements in soil quality. Additional research is needed to assess the avoided environmental impact.