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Benefits of farm-level disaster risk reduction practices in agriculture

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SUMMARY POINTS, QUESTIONS AND ANSWERS

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Background

This third webinar on disaster risk reduction and management was presented as part of a series of webinars organized by **KORE** - the Knowledge sharing platform on resilience- within the INFORMED programme and dedicated to sharing knowledge on resilience building. This series of webinars is the result of a collaboration between EU-DEVCO and FAO strategic programme on resilience.

Introduction

This webinar was the third of the three-webinar series on disaster risk reduction and management in agriculture. It introduced the background, approaches and methods of the recent FAO study on measuring the benefits of farm-level disaster risk reduction (DRR) practices in agriculture, its preliminary result from the pilot study on 25 different agricultural DRR practices in 5 countries.

Experience from the field in Uganda was shared, on how the practices were monitored, its results and lessons learnt. Philippines shared the perspective from the Government on challenges and opportunities in upscaling the practices at national level.

Summary points

1. Introduction to the preliminary study *Benefits of farm-level disaster risk reduction practices in agriculture*

Presented by Niccolò Lombardi, Disaster Impact Assessment and Disaster Risk Reduction Expert, FAO

1.1. DRR good practices in agriculture

DRR good practices in agriculture are practices that help reduce the vulnerability of agricultural households and communities to natural hazards such as dry spell, drought, floods, storms, typhoons, frost, snow, pest and disease outbreaks, among others. These practices include farm-level interventions such as:

- Improving agricultural infrastructure and equipment. For instance, installing rooftop water harvesting systems in drought-prone areas;

- Applying good agronomic practices, such as mulching to retain soil moisture;
- Diversifying livelihoods. For example, starting indoor mushroom cultivation as an additional income generating activity in communities vulnerable to hazards;
- Adopting stress-tolerant varieties or species;
- Or a combination of the above interventions.

1.2. Goals in measuring the benefits of DRR good practices

FAO delivers many DRR good practices. However, unsystematic monitoring and evaluation results in fragmented showcase of their performance. Therefore, a coherent and comparable approach is needed to measure the benefits of the DRR good practices that FAO and the Governments implement. Especially important is to find out **how much damage and loss can be avoided** through the implementation of DRR good practices at farm-level, and to **identify the practices that have the highest potential for replication and upscaling**. Eventually, this information would **provide policy makers with key evidence to make informed decisions** and direct investments towards the most successful DRR practices that improve the resilience of agricultural livelihoods.

1.3. Phased approach of the study

The study *Benefits of Farm-level DRR Practices in Agriculture* follows a phased approach. In the **pilot phase**, the study focused on 25 practices that build resilience to specific hazards in crop, livestock and fisheries subsectors in 5 countries, namely Bolivia, Cambodia, Lao PDR, Philippines, and Uganda. The preliminary findings are summarized in a report. The **final study** will be completed in 2018, and it will include a wider number of practices covering more countries and hazards.

1.4. Methodology

The study adopts an **empirical research design**. FAO and national partners monitor DRR good practices throughout different agricultural seasons, and compare their performance with that of usual practices. The performance is compared in non-hazard years and in acute hazard conditions. Both DRR good practices and usual practices are implemented in field plots located adjacent to each other so that conditions would remain the same. The aim is to identify those practices that perform best when exposed to natural hazards, while performing no less better than previously adopted practices when no hazards occur.

The methodological steps include data collection, field-level appraisal, and upscaling analysis.

First, farmers and agricultural extension staff **collect key field data** through quantitative and qualitative interviews with the agricultural household members. **Quantitative data** collected at farm level include cost of inputs (fertilizer, pesticide, labour, seeds, fodder, feed etc.), maintenance and capital costs, and data on agricultural outputs (yields, production). Furthermore, **qualitative interviews** bring insights on farmer's perception on good practice performance and helps to understand social and cultural impacts and barriers that the quantitative economic analysis may not capture. Also, **baseline data** on the household profile and the impact of hazards in the past 5 years are collected prior to field monitoring.

Second, FAO conducts **cost-benefit analyses** in order to compare the performance of DRR good practices with that of the usual practices under different conditions. **Qualitative evaluations** are also carried out based on the interviews.

Third, customized models are used to **simulate the potential benefit of scaling up** the good practices, taking into consideration potential agro-ecological, socio-economic and cultural barriers.

Eventually, the DRR practices are **assessed according to four main criteria**: (i) agro-ecological suitability; (ii) socio-economic feasibility; (iii) increased hazard-specific resilience; and (iv) environmental co-benefits. The final output is an integrated assessment of economic, social and environmental impacts of each DRR good practice.

1.5. Key findings

On average, the **net economic benefits** from farm level DRR good practices are about **2.5 times higher** than those of the practices previously adopted by farmers, livestock raisers, and fishers.

All farm level practices analyzed are **no-regret measures**. This means that the improved practices help increase agricultural productivity regardless of the occurrence of hazards.

Most farm level good practices bring **environmental co-benefits.** They ease pressure over water resources, improve soil quality, cut down the amount of inputs needed for production. In some cases, they reduce pollution and lower carbon emissions.

The performance of the good practices is highly **context specific** and more studies are needed to fully assess their upscaling potential.

In order to replicate and scale up the good practices, **key challenges and concerns** need to be addressed. They include **access to credit, markets, services and inputs** by agricultural households and communities.

2. Monitoring and evaluation and cost benefit analysis of DRR good practices in Uganda

Presented by Emmanuel Zziwa, Climate Change Adaptation Expert, FAO Representation in Uganda

2.1. The impact of climate change in agriculture in Uganda

Uganda is experiencing an increase in number of disasters caused by natural hazards. Every year, an average of 800 000 ha of crops are destroyed by climate-related events. Uganda will lose 140 to 260 billion USD between 2010 and 2050 in agriculture and water sectors if no actions are taken to adapt to climate change.

2.2. The information gap

There are limited efforts to collect data and analyze the impact of climate-induced disasters on agricultural production in Uganda. There is a lack of standard procedures, methodologies and capacities. Moreover, in many cases, adaptation projects are monitored via qualitative assessments only and damages and losses avoided through DRR technologies at local level are not quantified. There is a need to harmonize the monitoring and evaluation of DRR technologies to better document and capitalize on the knowledge and lessons learned.

2.3. Project context

In Uganda, FAO and the Government are implementing a project called *the Global Climate Change Alliance (GCCA) on Agriculture Adaptation to Climate Change in Uganda* since 2012. As part of this project, farmers were trained on a set of good practices to enhance their resilience to increasing dry spells in the central cattle corridor of Uganda.

2.4. Monitoring process

In 2016, FAO **selected eight good practices** introduced by the project and monitored their performance in six villages during consecutive agricultural seasons. **Main hazards** affecting the area were drought, dry spell or delay in rainy season and pests. The selected practices represent different agricultural sub-sectors, such as crop, livestock and fisheries.

Field trials were set up, choosing the plots for the good practice and the usual practice within the same or neighbouring farms. After that, **baseline, monitoring and evaluation information were collected**.

Qualitative information was gathered on how the farmers perceived the performance of the good practice, for instance, the perceived impact of hazards, performance of good practice in connection to the livelihood, access to climate information, replicability and sustainability of the good practice including on any negative impacts.

2.5. Cost benefit analysis

Cost benefit analysis was conducted to assess the effectiveness and the feasibility of the good practice through the monetary valuation of costs and benefits. The results were presented in the form of **Net Present Value (NPV)** and **Benefit Cost Ratio (BCR)**.

2.6. Monitored good practices

- Multi-stress tolerant bean varieties
- Improved maize varieties
- Rooftop water harvesting and water storage tank for vegetable production (tomato, cabbage, ntula)
- Indoor mushroom cultivation for livelihood diversification
- Coffee cultivation with mulching, digging of trenches for water retention, organic composting and planting of shade trees
- Banana cultivation with mulching, digging of trenches for water retention, organic composting and improved varieties
- Cattle raising with zero grazing, improved cattle breeds and drought-tolerant fodder
- Chicken raising in chicken houses and improved chicken breeds

2.7. Brief result of the qualitative assessments

It was found that the number of farmers practicing the good practice after the training via the Farmer Field School has increased. 91% of the farmers reported to have experienced the benefits of the good practice.

2.8. Example: Improved maize varieties

Maize farmers in Uganda were concerned over the low yields of local maize varieties, which were often negatively impacted by the changing rainfall patterns and prolonged dry periods. Five kinds of improved, drought-tolerant varieties were introduced to replace the local ones.

Farms in 3 districts were monitored during the 2016 dry season when all farms were affected by dry spell. The result was that the average net benefit brought by the improved variety were more than double the local variety. The benefit cost ratio of improved varieties is 2.9, as compared to 1.75 for the local variety.

Moreover, it brought environmental co-benefits. As it matures faster, it reduces the use of water and other inputs. It also had high stover yield which was beneficial for livestock feeding.

2.9. Example: Cattle raising with zero grazing, improved cattle breeds and drought-tolerant fodder

A mix of interventions were introduced to increase the productivity and enhance the resilience of cattle raising in Uganda. The practices include: (1) zero grazing, which is a type of production system where the animals are kept in an enclosure to control input use and reduce the incidence of diseases; (2) improved cattle breeds that are more productive and resistant to diseases; and (3) drought tolerant fodder to ensure cattle feed is available also in dry seasons.

Farms in 5 districts were monitored during the 2016 dry season and all farms were affected by dry spell. The average net benefit in the farms that adopted the good practice was 147% higher than non-adopters. The benefit cost ratio of improved varieties is 2.9, while it was 2.8 for the local variety.

It had additional environmental co-benefits as it reduced pressure on land and increased restoration of degraded grazing lands. Manure was collected and utilized for biogas and fertilizers for soil improvement.

2.10. Example: Indoor mushroom cultivation for livelihood diversification

Mushroom cultivation was introduced to farmers as a new income generating opportunity for livelihood diversification, especially during the dry season. Since mushroom cultivation was not previously practiced, the opportunity cost of agricultural labour was used for comparison, i.e. the income foregone by not employing the labour used for mushroom production elsewhere.

During the dry spell, the projected net benefit over 11 years is more than seven times higher in farms that adopt the good practice, as compared to the opportunity cost. The benefit cost ratio of the good practice is 4.7. In addition, mushroom cultivation requires limited amount of water and land compared crops, making it beneficial for the environment.

3. Perspectives from the Philippines on upscaling the DRR good practices

Presented by Jiwon Rhee Climate Resilience Officer, FAO, on behalf of Christopher Morales, Chief, Field Programs Operational Planning Division at the Department of Agriculture in the Philippines

3.1. Philippines context

The Philippines is one of the most disaster-prone countries in the world. The Philippines Government is taking active measures and has designed its DRR Strategic Framework to enhance the resilience of farming and fishing communities to disasters. The goal is to fully mainstream disaster risk reduction and management into the agricultural and fisheries sectors by 2030. To achieve this goal, the Philippines Department of Agriculture is working in close partnership with FAO, especially to improve the information for evidence-based decision-making in disaster risk reduction.

3.2. Example - Green Super Rice

Green Super Rice is a rice variety that is tolerant to stresses such as drought, flood, salt water intrusion, diseases and insects. The Philippines introduced five Green Super Rice lines (1, 5a, 8, 11, 12a) and monitored their performance in comparison to the local rice varieties in Bicol and Caraga Regions during three consecutive agricultural seasons (the 2015 dry and wet seasons, and the 2016 dry season).

The result was that, when farms were affected by hazards (mainly flood and pests), rice production losses were reduced by 53% in the dry season and by 33% percent during the wet season. One farmer said that he wants to continue planting Green Super Rice because it has good taste, good quality, high yield and tolerance is an encouraging testimony of its benefit.

The Philippines Government, after testing the Green Super Rice for three seasons, is now promoting it and has included it in the Government's regular program.

3.3. Challenges in upscaling a good practice

First, a proper evaluation of the performance is needed, across different seasons, regions and agro-ecosystems. Ideally minimum 4 seasons to facilitate season-to-season comparison. However, oftentimes many projects do not last so long and field mobilization takes a lot of time. Therefore, it is important to have a mechanism in place for Government institutions to continue testing and evaluating the technologies beyond a project cycle.

Second, technologies and practices need to respect local agricultural extension contexts. Up-scaling will be effective and sustainable only when we have the clear understanding and buy-in from farmers and their communities.

Third, equally important is that the practice gets strong, genuine and sustained support from local government units and agricultural extension. In case of the Philippines Department of Agriculture, the officials at the regional end and extension officers are being managed by the local chief executive or the mayor who plays a key role in providing day-to-day farming advice. It is thus important to ensure that local agricultural extension support is present and serve as a link to the Central Government that could allow proper feedback and learning.

Finally, the good practice technologies need to be seen as part of a bigger agricultural production system and value-chain. Mechanisms to ensure market access and demand of new varieties and seed production support to guarantee availability of quality planting materials are needed. Moreover, considering possible inter-generational degradation of performance characteristics, continued researching and testing to identify next generations of stress-tolerant varieties is necessary.

3.4. Upscaling simulation of the Green Super Rice

The upscaling simulation assumes the adoption of Green Super Rice lines in 50 percent of the total rice land in Bicol region. Results show that Green Super Rice upscaling would bring an increase in the annual average net economic benefits from overall rice production in Bicol region in both the dry and rainy seasons. The largest difference between Green Super Rice upscaling and business-as-usual is observed when hazards are more frequent, suggesting that Green Super Rice lines are particularly effective under hazard conditions. In particular, Green Super Rice helps prevent a significant share of losses during the dry season, when farms are affected by dry spells. Overall, the amount of potentially avoided losses through Green Super Rice upscaling ranges between USD 33 and USD 129 million per season, on average.

Questions and answers

- **Most of the practices that you have mentioned are usually considered good or sustainable agricultural practices and are promoted in most agriculture projects. Could you give an example of practices that contribute specifically to DRR that we would not necessarily do if we didn't have a resilience entry point?**

Indeed, these practices are not exclusively related to DRR, and there are several conservation and sustainable agricultural practices. With that said, the goal of the study was not to validate these practices, but rather to monitor the performance of these practices in hazard contexts. The link to DRR is to see how well-documented and validated good practices perform in contexts of hazards affecting vulnerable communities and exposed areas. There are more specific DRR practices analyzed as part of this preliminary study, such as: the use of shelters for the protection of livestock from snow and heavy rains in the Andes in Bolivia. In the full report, which will be released next year, more specific DRR practices may be added.

- **Can you clarify the sampling methodology used for this pilot study? How were the sub-sectors selected?**

The methodology used was the simple random sampling method, which you can read more about it in the *Benefits of farm level disaster risk reduction practices in agriculture* publication. When we were selecting the 25 practices, we chose from ongoing FAO projects and we tried to consider the different agricultural sub-sectors. We will do an extended study in the future in more countries with more hazards to better represent the agricultural sub-sectors.

- **Are you disaggregating data by sex and age in the qualitative assessments? How are you capturing the gender dimensions in the monitoring system?**

When we were collecting the data from the field, we always disaggregated by gender and age. Many of the respondents during our interviews, especially from Uganda, were women. As mentioned in the presentation, in the case of the distribution of income and diversification activity of the mushroom case study, the results showed that the practice was benefitting the women by enhancing nutrition, production and income. In the other case of rooftop water harvesting and water storage tanks for vegetable production in drought-affected areas in Uganda, women mainly collected water and this practice decreased their labor time.

- **How was the value of avoided losses calculated?**

Avoided losses were calculated by comparing the good practice plot and the usual practice plot when hazards occurred. Therefore, by analyzing the difference in the performance of the good practice and the usual practice in hazard conditions, we were able to gain insights on how much losses could be avoided through the implementation of the DRR practice.

- **Have you developed Farmer Field Schools (FFS) curricula for those improved options that could be used in other countries?**

Some of the practices analysed for this study were implemented and promoted as part of Farmer Field Schools (FFS). The idea of further developing FFS curricula for the most effective practices is being considered for further development.

- **In Uganda, what were some lessons learned from the implementation of DRR practices and from the monitoring of these practices? Did the farmers think it was a useful exercise? Are there plans for replication and upscaling?**

Farmers were interested in learning more about (i) adaptation practices, (ii) how these practices benefit them, (iii) what are the costs involved to access them, and (iv) what are the costs involved in implementing the adaptation practices and the benefits that accrue. The farmers were very cooperative and the results we obtained were shared with them. This enables them to make more informed decisions based on the results. Before that, we used to take a mix of everything; i.e. what we think as researchers, as development partners, the good practices successfully implemented in other countries or within other farming systems, and bring all that to farmers in other agro-ecological systems. The cost-benefit analysis is now helping us to explain to farmers even before we tell them to adapt to various things, and we even share the expected returns for adaptation with them. Similarly, we shared this with the European Union — the funding agency for this project — and based on the results we were able to request an upscaling for a new project which the EU has funded.

- **It is always clear to me that the insurance adds benefit. I have, however, some problem with priorities; i.e., if a poor farmer, or low income government has only limited resources, then is it wise to spend on such insurance scheme while other needs such as medication, food, education are more pressing? Did you address the issue of competing priorities in the study?**

This is a very important point. Insurance schemes in agriculture have proven to be effective as risk transfer measures. They have not been assessed in this specific study, but of course the issue of managing competing priorities is one that needs to be addressed at the government level when planning and budgeting for DRR. This is an exercise that is done on a case by case basis. However, the more information and studies we have on the costs and benefits of these practices—including insurance schemes – the more information can be provided to decision-makers at national levels when planning, budgeting and deciding on different priorities.

- **Is the Green Super Rice (GSR) applicable in the flood-prone areas of Bangladesh? What are the varieties and their cultivation technology?**

The five lines that the Philippines uses for the GSR are 1, 5a, 8, 11 and 12a. As emphasized in the presentation, all these practices are very context- and location-specific. We need to be very careful to say that these practices are applicable in different contexts. A successful performance in one context does not guarantee a successful performance elsewhere. More analysis on data and replicability in other contexts is thus necessary. In the *Benefits of farm level disaster risk reduction practices in agriculture* publication, in Annex A, the practices and their links to dedicated TECA (Technologies and practices for small agricultural producers) pages with further in-depth detail on each practice can be found.

For more information

- Benefits of farm level disaster risk reduction practices in agriculture: Preliminary findings
- Sendai Framework
- United Nations Office for Disaster Risk Reduction (UNISDR)
- Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED)
- The Impact of Natural Hazards and Disasters on Agriculture and Food Security
- Resilient Livelihoods: Disaster Risk Reduction for Food and Nutrition security
- FAO Strategic Programme on Resilience
- FAO e-learning tool 'Planning for Community Based Adapation (CBA) fto climate Change
- FAO Policy Series: Disaster Risk Reduction in Agriculture (video)

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