Research on scenario planning for tool development: minimizing regret in seed supply

Report to Integrated Seed Sector Development (ISSD) Africa program

Wageningen Centre for Development Innovation

Final report

Output D:
Sustained application of the project outputs

- **Activity 7: Documentation of elicitation procedure**
- **Activity 8: Reflection event**
- **Project synthesis**

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Activity 7: Documentation of elicitation procedure

Goal: *To create a replicable step-wise guide that allows seed sector stakeholders to adapt the excel template to local context, using data on scenarios, seed demand, and scenario probabilities.*

This project included a participatory design process, including stakeholders from Seed Co Ltd., Zimbabwe, and ISSD partners OSE and ESE, Ethiopia. The goal was to create a replicable standard procedure that would allow mildly trained users in seed supply organizations to generate seed demand forecasts as an input to decision-making. This procedure is embedded in three outputs, all of which are attached to this report:

1. A workshop guide for a half-day meeting, including an introduction to the scenario planning concept and a guided, joint usage of the MS Excel tool.
2. An MS PowerPoint presentation that leads through the workshop
3. The MS Excel tool where data are entered, and calculations and estimations take place

The workshop procedure and slideshow have been tested with decision-makers of ESE and OSE and were refined based on participant feedback. The materials are designed with the intent of allowing interested users to carry out the workshop and use the MS Excel tool without further training.

Activity 8: Reflection event

Goal: *To present the outcome of this project to a wider audience, discuss possible applications and synergies with other ISSD stakeholders.*

In June 2021, the Alliance of Bioversity International and CIAT contributed a session to the online *Conference on Guiding Seed Sector Transformation in Africa*, hosted by WCDI and KIT. The goal of this session was to (i) raise awareness among conference participants about the concept of scenario planning in seed supply, (ii) discuss possible use cases for scenario planning across different stages of seed supply chains, and (iii) collect qualitative feedback on the proposed procedure. The session was started by a brief presentation of the concept and its tentative implementation as an MS Excel workbook with embedded weblinks. Through a number of multiple-choice polls, the audience was invited to provide quick feedback to specific questions of interest (more information below). The presentation was followed by a panel discussion with three experts involved in the project:

— Dean Muungani, IITA-Nigeria, Senior maize breeder, Head of product development (speaking on behalf of SeedCo Ltd. Zimbabwe where he worked during empirical phases of the project)

— Jacob van Etten, Research Director, Digital Inclusion, Alliance of Bioversity & CIAT

— Marlene Kretschmer, Scientist, Department of Meteorology, University of Reading

Main discussion points and take-aways from the session can be summarized as follows:

1. Scenario planning based on seasonal climate forecasts would be most useful at the seed production stage. However, production decisions are typically made at least a year before the season of interest, and skillful climate forecasts with >6 months lead time and global resolution are not available. Thus, scenario planning is more likely to be reaslistic for post-production decisions. About half of the respondents to a session poll mentioned production planning as the stage where seed demand forecasts would be most beneficial. An alternative, reasonable use case for scenario planning would be at the stage of packaging and distribution, which takes place within weeks before the beginning of the season. Rather than

influencing production decisions, scenario analysis could enable seed suppliers to adapt the respective quantities of each seed variety that are cleaned, treated, packaged, and allocated to different regions or warehouses.

2. Seasonal scenario planning could be useful not only to seed suppliers interested in meeting the demand for their existing products, but the principle of scenario planning could also be integrated into other parts of the seed sector, in particular breeding processes. A good understanding of seed demand under different seasonal scenarios could, for example, enable breeders to develop varieties that optimize overall performance considerung the expected shifts in future scenario probabilities. For farmers, these cultivars would be risk-minimizing varieties, and different economic risk strategies could be considered during the breeding process, leading to different varieties.

3. This project has demonstrated the potential of the general principle of scenario planning in seed supply, but locally specific, finetuned tools are more likely to be useful than a generic, globally applicable tool. To explore the seasonal scenario planning concept and generate a universally applicable solution, this project used a global precipitation forecast with a maximum six months lead time and relatively low geographic resolution. Climate science could, however, provide much more case-specific, skillful forecast products depending on user needs. This could include probability forecasts for other climate phenomena (e.g. El Niño), and longer lead times. Beyond a focus on probabilities (in our case, exclusively based on seasopnal precipitation), climate science could also help in building locally consistent scenarios, consisting of different relevant phenomena (for example, drougt spell during germination phase + elevated heat during grain filling). In the future, more direct collaboration between potential users of climate forecasts in scenario planning (seed companies, breeders, NGOs) and climate scientists may lead to the development of more practice-oriented scenario planning tools.

Project synthesis

This project involved a participatory design process involving seed sector decision-makers from two countries. Over the course of the process, the ambitions, scope, and specific features of the decision-support tool were specified and refined, in part diverting from original expectations. The project has generated valuable insights on decision-making processes in seed supply chains, and practical opportunities for better matching supply and demand throught the use of seasonal climate forecasts.

A main take-away is that, generally speaking, risk in seed supply can indeed be mitigated by using seasonal climate forecasts. As a proof-of-concept study, this project has shown that there is industry interest, among both public and private users. In a case study with maize sales data from Zimbabwe, we found that seasonal rainfall has explanatory power for varietal demand. Probabilistic seasonal rainfall forecasts are freely available online and are understood by decision-makers. This evidence underscores the possibility of using forecasts to anticipate varietal demand in practice.

A number of challenges have also appeared, however. In the case study, compiling reliable data on seed distribution at variety level has been a challenge. The inclusion of seed scenario planning in decision-making processes should be preceded by the systematization and centralization of seed distribution records, which may require institutional adaptations in seed supply organizations. In part, imperfect data accuracy may explain why a relatively weak (but not absent) association between seasonal climate and varietal demand was observed. More importantly though, there is a need to recognize that farmers' seed demand is driven by diverse factors, of which seasonal climate is but one. This is why the seed scenario planning tool is presented as a mere input to expert decision-making: it highlights the likely influence of seasonal climate on seed demand, but cannot claim to truly 'forecast' demand. At multiple instances, involved seed sector stakeholders have in fact asked for more precise demand predictions than the categorical, relative statements provided by the MS Excel tool (e.g. 'higher than average' or 'much higher than average'). Point estimates could be provided, in theory. But due to the weak statistical power of the

regressions in the case study, we decided against providing such an output, to emphasize the need for expert discussions rather than taking the forecasts at face value.

A key part of this project consisted in understanding the decision-making processes around seed distribution within the partner organizations in Zimbabwe and Ethiopia. One important learning has been that with current, rather linear processes in seed supply, adaptive decision-making based on scenario analysis is hard to accomodate. Seasonal forecast information is available no earlier than six months before the planting season. At this time, major seed supply decisions have generally been made, already. In particular, it is too late to influence decisions around seed production, which would be the major lever to match supply and demand. This project has thus emphasized the use of scenario planning for more adaptive decision-making at later stages of the seed supply chain, including chemical treatment, packaging, and logistics. With current practice, there is limited flexibility in these stages, for example, regarding the prioritization of certain varieties over others, or shelving a share of certain varieties to avoid unnecessary treatment/packaging/shipping. An effective use of seed scenario planning would also require moving away from a rigid, linear succession of operations in seed supply, towards increased agility. For example, while great amounts of seed could originally be shelved based on a forecasted low demand, they could be treated, packaged, and shipped later in response to an unfolding high-demand scenario.

We believe the main insights from this proof-of-concept study are encouraging for the general prospect of using forecast-based seasonal scenario planning in seed supply. A key recommendation for practical applications in the future consists in moving beyond a generic, globally applicable tool, such as the one we experimentally developed. More regional, case-specific decision-support tools that consider locally relevant climate phenomena – going beyond seasonal rainfall – possibly at longer lead times can be developed together with climate scientists. Our low-tech approach to the decision-support tool, consisting in an MS Excel workbook with embedded weblinks, has generated valuable insights. Yet eventually, offering seasonal scenario planning tools as freely accessible one-stop websites would likely provide a more inclusive user experience.