Seasonal scenario planning for matching seed supply and demand

Workshop format for seasonal seed scenario planning
using a climate forecast and the MS Excel decision support tool

This document describes a workshop procedure for seasonal seed scenario planning. It is guided by a powerpoint presentation and revolves around jointly using the MS Excel tool for scenario planning, and leveraging informed decision-making on seed supply.

The workshop is planned as a half-day format with decision-makers at seed supply organizations. There is a need for a prepared facilitator, who should familiarize in advance with this document as well as the MS Excel tool.

Goals of the workshop

Familiarize with the concept of scenario planning based on climate forecasts

Predict scenario-specific seed demand in the target region, using the MS Excel tool

Enable collective decisions on seed supply planning to minimize economic losses

Enable collective decision-making on responses to future scenarios

What is needed

Meeting room with internet access and projector

3-5 decision-makers from a seed supply organization

Data about distributed seed quantities in the past, at variety level

The seed scenario planning tool: an MS Excel workbook

A well-prepared facilitator

Notes to the workshop leader

Thank you for carrying out a seasonal seed scenario planning workshop! You can either be a member of the seed supply organization, or an external facilitator. In either case, please familiarize with the scenario planning concept in advance, using both this document and the PowerPoint presentation. Take about two hours of time for this preparation. Eventually, you shall be able to explain the concept to the participants.

Please also familiarize with the MS Excel tool and test the procedure, including the rainfall data download. Most importantly, before the workshop, you should compile data on past seed distribution (sales / handouts) in your region of interest. This data should take the form of the table below, where each cell contains the total quantity of seed of a specific variety distributed in a specific year (for example, in tons). In principle, each variety can be of a different crop, but it will make most sense to include multiple varieties from the same crop. It is important that all workshop participants are aware about the region, crops, and varieties included in this scenario planning exercise.

	Variety 1	Variety 2	Variety 3	…
Last year	177	460	800	
Last year -1	200	800	480	
Last year -2	210	720	300	
…				

As the workshop leader, you have three major tasks: First, you request and compile the seed distribution data (before the workshop). Second, you give a presentation to ensure participants understand the general concept of scenario planning. And third, you facilitate joint decision-making by guiding the participants through the MS Excel tool and starting a conversation on implications of the results.

For a successful workshop, please project your computer screen to a suitable wall and ensure stable access to the internet. Do not pre-fill the MS Excel tool with data – filling it jointly at the workshop is important to create understanding. Towards the end of the workshop (slide 20), a flipchart will be useful for collecting participant's ideas while they still see the MS Excel results projected.

Activities and recommended timeframe

I) Clarify workshop objectives ~5 minutes

Welcome all participants and provide a brief overview of the workshop's main goals and activities.

This is a team exercise consisting of three major activities: · Learning about scenario planning · Jointly entering data to the MS Excel decision support tool and generating a seasonal forecast of seed demand · Discussing implications of the results and taking informed decisions	Slide 2

II) Explaining background and motivation for scenario planning ~10 minutes

Give a brief presentation about the concept of using scenarios for adjusting decision-making in seed supply to be prepared for different possible seed demand patterns.

Often, there is a mismatch between seed supply and demand: seed supply organizations need to plan production a year ahead, while farmers choose what to buy right before the season. Their exact varietal preferences are hard to predict. As an illustration, the diagram shows seed sales for different maize varieties: in years with little rain, demand for "Very early" varieties is higher than in years with much rain.	Slide 4
To mitigate economic risk, seed suppliers usually follow an "average" strategy. But it leads to sub-optimal outcomes because almost no year is truly average. In most cases, there will be either under-supply or over-supply of some varieties. But farmers' seed demand is related to seasonal climate: in dry years, farmers demand other varieties than in rather rainy years. Seasonal climate can be forecasted. Thus, to a certain extent, farmers' seed demand can also be anticipated. In consequence, seed suppliers can reduce economic risks by flexibly adapting the seed portfolio, using a seasonal climate forecast.	Slide 5
Scenario planning means being prepared for alternative futures. The process takes place prior before the planting season, when farmers acquire seed. It comprises five major steps: 1. Becoming aware of key drivers of uncertainty about seed demand (e.g., *"rainfall influences seed demand"*) 2. Envisioning alternative scenarios, i.e., stereotypical futures, based on the identified drivers of uncertainty (e.g., *wet/average/dry year*) 3. Assessing the probability of each scenario, using forecasts or estimates 4. Based on the probability of each scenario and their respective implications, taking optimal, risk-minimizing decisions (e.g., *when the forecast leans towards*	Slides 6

a wet season, distribute a rather 'wet' portfolio with a slightly elevated share of late-maturing varieties.) 5. Still plan a response to each scenario. Remember we cannot know for sure which scenario will happen. The goal is to plan in advance what action to take in the event of each scenario occurring. The idea is not to exactly predict climate and then suggest an optimal strategy. The goal is to consider the different probabilities for the different scenarios, and develop a smartly balanced response.	

III) Simple exercises to become familiar with the concept of scenario planning ~15 minutes

Engage the participants in two interactive exercises that illustrate the concept of taking decisions under uncertainty, where alternative scenarios and their probabilities influence choices. Explain each exercise and let each participant take a decision, then have a discussion about their reasons and considerations for deciding for the one or the other.

Exercise 1: Simple binary choice to show that life is full of scenario-based decisions: Should you carry an umbrella or not? Scenario 1: it will not rain (probability 85%) Scenario 2: it will rain (probability 15%) High risk of carrying an umbrella for nothing (high risk but light negative consequence) vs. low risk of getting soaked in rain (low risk but strong negative consequence). This exercise has no 'correct' answer.	Slide 8
Exercise 2: A more complex example that requires a balanced response: How much late-maturing seed should be packed and shipped? Imagine this scenario: in years where rains are late (dry rainy season), long-duration varieties make 20% of all sales. But in years where rains are early (wet rainy season), farmers want more of it, so long-duration seed makes 50% of sales. For the upcoming season, a climate forecast tells us: Scenario 1: Rather dry season (probability 33%) Scenario 2: Rather wet season (probability 67%) The overall risk-minimizing strategy consists in weighing each scenario's optimal solution by the scenario's probability: 33% probability * 20% share of long-duration varieties + 67% probability * 50% share of long-duration varieties = 40 % share -> The risk-minimizing solution is to dispatch 40% long-duration seed. In the event of a dry season (less likely), this will mean a 20% oversupply. In the event of a wet season (more likely), this will mean a 10% undersupply.	Slide 9

IV) Introduction to the MS Excel tool for scenario planning in seed supply ~ 20 minutes

The MS Excel tool will be the main input into decision-making, as it will provide a forecast of farmers' seed demand at variety level. It is important that participants understand that the tool considers the different scenario probabilities and provides a balanced output, rather than just focusing on the most probable scenario exclusively.

A decision-support tool for scenario analysis in seed supply planning has been implemented as a workbook in MS Excel. It is free to use on anybody's personal computer. It requires three types of user input: 1. Historic daily rainfall estimates, to categorize past seasons as wet/average/dry (localized datasets are free to download from ClimateSERV) 2. Data on sales of different varieties in previous years, supplied by the user 3. A probabilistic seasonal rainfall forecast, giving probabilities for a wet/average/dry upcoming season (freely accessible online at Copernicus)	Slide 11
Just for illustration – an example of a seasonal rainfall forecast. Using actual seasonal rainfall records from the last decades, the forecast determines at what probabilities the upcoming season will be · one of the 33% most-rainy years (a rather wet season) · one of the 33% least-rainy years (a rather dry season) · one of the 33% years in between (an average season) These strata of years are called 'terciles'. For example, from 30 years on record, the 10 most rainy years are in the 'upper tercile' for rainfall. On the long run, each scenario has the same probability! But for the upcoming season, a climate forecast gives a probability estimate for each scenario. For example, in central Sudan (highlighted in blue in slide 11), the estimated probabilities were: Wet season: 55% Average season: 25% Dry season: 20%	Slide 12
What the tool does & limitations · The tool gives predictions about farmer demand for different seed varieties of rain-fed crops in the next season · It fits a regression from past weather and seed demand, and uses the model to make a prediction for the next season · It only provides a rough estimate, as an input to expert decision-making · Rainfall can be reasonably forecasted at maximum 6 months in advance. This means the tool can hardly be used to plan seed production.	Slide 13
Possible use cases · Big seed suppliers (e.g., seed companies) who can optimize allocation of different seed portfolios to different regions, or prioritize expected high-demand varieties in chemical treatment and packaging · Small seed suppliers (e.g., NGOs) who can optimize the varietal portfolio they buy and re-distribute to farmers	Slide 14

Generated outputs Three types of results are generated: 1. Predicted total seed demand (sum across all varieties) 2. Predicted seed demand for each variety individually In both cases, the predictions are not given as absolute numbers, but by one of five categories: **much lower** more than two standard deviations below average **lower** at least one standard deviation below average **about average** within one standard deviation around average **higher** at least one standard deviation above average **much higher** more than two standard deviations above average 3. Reference years: Up to four years where rainfall was similar to the forecast season. This can help to identify important similarities between these years.	Slide 15

V) Coffee / tea break ~ 15 minutes

VI) Time for action: Jointly using the MS Excel tool for seasonal scenario planning ~ 60 minutes

As a group, the participants now use the MS Excel tool, filling in data and generating results together. To create thorough understanding of the process, it is important to not rush and jointly follow through all steps, including downloading rainfall data and generating the seasonal forecast. To be on the safe side in case of internet problems, you should nonetheless have the data downloaded beforehand. No parts of the tool should be pre-filled. You should have practiced beforehand, but then remove all your entries afterwards.

Project the MS Excel tool for everyone to see. It will be used jointly, but led by the workshop facilitator (rather than everyone using it individually on their PC). Worksheet 1: enter sales data · Select the current year. · Select your crops from the drop down lists in row 5. One column per variety. · Type the variety names in row 7. · Enter the data you have compiled before the workshop into the grid. You might complete missing data by asking the participants for estimates, if needed. Worksheet 2: get rainfall data · Click the weblink in B6 to open the climateSERV website in an internet browser. · Carefully follow the instructions given in the excel sheet. · Download the daily rainfall estimates for your study region and save the file on your computer. Worksheet 3: insert rainfall data · Paste the downloaded rainfall data into cell A3.	Slide 17

· Verify the rainfall diagram in E22. Does it look correct? If not, go back to climateSERV and download new data. Workbook 4: get seasonal forecast · Select the three-month forecast period in E4 (main agricultural growing season) · Also select the year of your forecast in E7. · Click the weblink in E10 to open the Copernicus Climate Change Service website in an internet browser. · Set the Base time (as recent as possible) and select the Area (your continent) · Check each of the three tercile maps individually (lower / middle / upper tercile category) and carefully note the probabilities for your study region. · Select the best-fitting category in E54, E55, and E56. Workbook 5: results · Jointly review your settings in I4 and J4, as well as in I8, I9, and I10 to be sure your settings are correct. · Explore Result 1. Forecasts on the expected total seed demand are provided in H14 and H15. Be sure to remember how the output categories are defined (see the table in B17). · Explore Result 2. Variety-specific demand forecasts are provided in B29 to K30. Focus especially on any results that are not 'about average'. · Explore Result 3. Variety-specific demand in climate reference years (years with similar seasonal rainfall amount as the forecasted season) is given in B33:K36. Look for trends in certain varieties, for example, seed demand usually	

VII) Jointly discussing implications of results for decision-making ~60 minutes

The results generated by the MS Excel tool serve as inputs to discussions among the participating experts: now that there is a forecast on farmers' seed demand, what elements of the seed supply chain can be strategically changed to reduce economic risk? Everyone should provide their expertise. As the workshop leader, try to facilitate the discussion by pointing at relevant results, and synthesize the experts' opinions to reach a consensus on recommended adaptations in seed supply management for the upcoming season.

The results in the MS Excel tool show for which varieties demand is likely to diverge from the average. If production was average, this may mean over-supply (carry-over of unsold seed) or under-supply (variety sold out, farmers buying with competitor). Among workshop participants, discuss: **How can the seed supply organization smartly use this information to avoid unnecessary costs?** Some ideas are provided in the PowerPoint slide. But the participants in the workshop will certainly have better, more specific ideas. Discuss and note down the ideas. The goal is to jointly agree on modifications of the procedure in seed supply, based on the seed demand forecast.	Slide 19

Even if the seed supply strategy is optimized considering the demand forecast – it's useful to be prepared for any circumstance. In this last step, the objective is to design an action plan for each scenario – what to do in case it happens, and what to prepare in advance.

A hypothetical, minimal example:

It will be a…	Varieties in under-supply	Varieties in over-supply	Responsive actions	Preparatory actions
Dry season	Very early maturing	Late maturing	Promote sale of medium-early varieties when very early is sold out. Sell unsold late-maturing seed as high quality grain to large buyer.	Prepare promotional materials (posters, radio ad) for quick release. Identify large buyer and set up agreement about the potential sale.

The goal is to have a detailed guide for each scenario, with actions that will mitigate the economic risk. The last column includes a set of preparations to be carried out already before the season. This will enable the action plans, even though only one will eventually go active.

Slide 20