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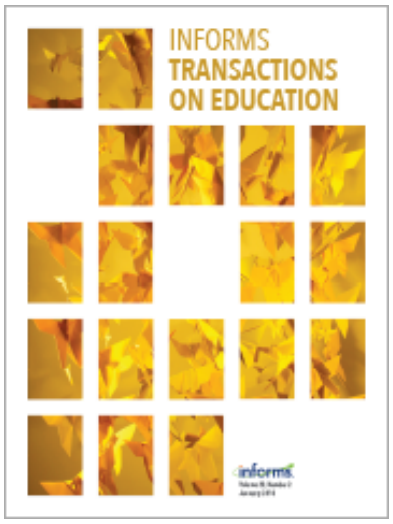

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Saurabh Bansal, Timothy J. Lowe, Philip C. Jones

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Case

Suncrest AgriBusiness Company: Exploiting the Flexibility of Backup Capacity

Saurabh Bansal,[a] Timothy J. Lowe,[b] Philip C. Jones[b]

[a] Smeal College of Business, The Pennsylvania State University, University Park, Pennsylvania 16802; [b] Tippie College of Business, University of Iowa, Iowa City, Iowa 52242

Contact: sub32@psu.edu, https://orcid.org/0000-0001-5443-4144 (SB); timothy-lowe@uiowa.edu (TJL); philip-c-jones@uiowa.edu (PCJ)

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A Mixed-Feelings Day at Corporate Headquarters

"I hope it is not one of those things that is too good to be true," said Snodley to himself on the way to his office. Flavio Snodley had been working with Suncrest for the last 15 years. During this time, he had pushed for using data-driven methods to make decisions at Suncrest. Most recently, he had supported Suncrest's acquisition of a midsize firm in Chile. This acquisition was driven by two factors. First, Chile was a rapidly growing market for seed corn and provided a revenue diversification opportunity for Suncrest. The second motivation was closer to home. In the last few years, Snodley had led an analytics group that supported an annual seed corn production plan for the U.S. market. It had, however, become clear in the last two very dry summers that seed corn production was risky and dependent on the vagaries of weather. William Buckhead, a senior vice president and Snodley's boss, was frustrated over his helplessness. "I thought we learnt our lesson two years back that weather could play the spoilsport when producing seed. We used a much larger area of land to produce seed this year, but the summer was worse this year and yields were even lower. We again have too little inventory to be competitive. I wish I could go back in time and redo the plan." Snodley hoped that the acquisition in Chile would help mitigate this risk.

Seed Supply and Demand

Each spring, farmers decide whether they would grow corn in their fields. If a farmer chooses to grow corn, he or she tries to procure the seed that is best suited for the local land, moisture, and temperature conditions. Commercial firms, such as Suncrest, have developed hundreds of varieties of seed to meet these demanding requirements. These customized varieties of seed are produced by hybridization, a process in which two varieties of corn are grown in different rows in the same field. A carefully controlled pollination process in which the male parts of plants of one variety are removed to make them act as female plants (in a process called detasseling) leads to the production of hybrid seeds. The parents are selected carefully based on their individual characteristics to obtain the required combination of characteristics in the hybrid seeds.

Two features of seed corn production lead to some unique features of the commercial seed industry. First, the production process is carried out in open fields and is subject to natural variations. As a result, the number of bags of seed obtained per acre of land is uncertain. Second, the hybridization process is tightly controlled by firms with several parents being developed using genetic modifications in order to skip several generations of natural evolution. Much of the hybrid seed in the market today is proprietary, and any shortage of a seed-type at a firm is usually not possible to overcome by a simple purchase in the spot market for equivalent seed.

The Second Helping

Snodley piled his plate with corn dumplings and sausage and found his way to his lunch table. Ashish Phillips

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from operations and Linda Gregory from production were waiting for him.

"So you pulled it off—good for you!" Ashish said.

"Well, I am hoping that we can use the Chile division to help us with our North American market."

"How so?" Ashish asked. Linda put her fork down and leaned in to listen.

"Well, think about it. We produce our seed from April through August, during our spring and summer. We have been getting really low yields in the last two years, and we are stuck when that happens because we cannot produce the seed a second time in North America. But the Chile division makes a second round of seed production possible. Starting in October, it is too cold for us in North America to grow the seed. But Chile starts to get its spring season around the same time. So once we know just how bad the yield is in our North American fields, we can produce the seed again a second time in Chile."

"Oh. That's clever. But we would then need to ship that seed back to North America. Have you run the numbers? How costly is it? As much as I would like to have a backup plan in case our yields in Iowa are bad, I wouldn't want to sell our seed at a loss," Linda said.

Snodley nodded, "Yes, I ran some numbers. You are right, we need to be careful. Seed is heavy to transport! Producing it in Chile and shipping it here makes it more costly to produce. So if we were to produce all our seed in Chile and ship it here, we won't make as much money; but on the other hand, if we really use it as a genuine backup, then we can avoid severe shortages while not always incurring the high cost."

Ashish was enthusiastic: "Well, so how do we go about figuring out a production plan with Chile in mind? I would give anything to avoid massive shortages again this year."

"Let me get a second helping, and then we can work out the details," said Snodley.

Planning for Flexibility

The team met again Wednesday afternoon the next week. Snodley entered the conference room sipping his black coffee.

"Good, so we all are here. . . . Listen, I have talked to Bill Buckhead. He is willing to play ball regarding Chile, but cautiously."

"What do you mean?" asked Ashish.

"Well, the mandate is that we don't try to plan our seed corn production with Chile in mind for all seeds. Let's focus on the seeds that are driving a bulk of our revenue and that we can't afford to have a shortage of. The idea is that we can get a political buy-in for these seeds because they are clearly important for business for the next three years."

"So focus on seeds like Turbo18? We offer it in Iowa and that's where the big sales are," Linda clarified.

"Yes. So let's think through it. What do we know about that seed? Linda, how well can we produce it?"

"Well, field trials suggest that we should be able to get about 70 bags per acre, with a standard deviation of 16 bags per acre. I just looked through these numbers yesterday."

"Can we expect the yield to be the same in Chile?"

"Yes, I think so. Of course I am assuming that we will try to find suitable land for producing it."

Snodley now turned to Ashish.

"We are targeting this seed for farmers who we know will definitely grow corn. Just how large is the demand?"

"Around 85,000 bags. There will be a few other farmers who might decide to grow this variety, but 85,000 is a good number to plan for."

"OK. And what are we selling the seed for?"

"Again, there are slight variations, but $210 is a good number to plan with."

"OK."

Ashish was getting impatient and excited, "Okay, so how do we think about the options we have?"

"Look, here is what we will do. We will try to produce the seed in North America first. We know the per-acre production costs. If the yield is high enough that we can meet all 85,000 bags, we stay put. If the yield is lower, we then decide how many acres we need in Chile and then incur the steeper production cost."

"Okay, I see. So we will not produce in Chile every year, but only if we end up having bad years in North America like the last two. So if we do end up producing in Chile, do we ship all the seed back or only what we need?"

"Well, my kneejerk reaction is to say that we can always store it to sell it the next year, just like we currently do with excess seed produced in North America. So why not?"

"I think I understand," said Ashish, "but how do we put value on seed that remains unsold or is returned?"

"Well," observed Snodley, "what we currently do is the following: We store leftover seed in temperature- and humidity-controlled warehouses to preserve the germ plasm inside seeds. This substantially increases the probability that the stored seed will germinate next spring. The next spring, we perform germination tests on the stored seed and sell it only if the seed passes the germination test."

"Oh yes," said Ashish, "although we accept any seed a farmer wishes to return, what actually happens is that a farmer may have purchased seed but then ran into adverse weather that delayed planting. If that happens, he or she would switch to a different hybrid that would mature more rapidly. The original seed might be immediately returned to us for a full refund, but the farmer may have stored the seed for a few months in less-than-perfect conditions (e.g., a barn

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that was not entirely leakproof) prior to shipping it back to us. And so the returned seed may not always pass the germination test next spring. How do we factor all of this into the valuation?"

"The way we value unsold seed on North American production," observed Snodley, "is as follows. First, we reason that if we have a bag of stored seed available to sell, that means we could have produced one less bag of seed for that sales season. Because the total fixed cost of seed production in North America is $1,400 per acre and the variable cost amounts to $12 per bag, we could figure out the expected cost of producing one bag of seed. Using the expected yield of 70 bags per acre, that would give us an expected production cost of $32 per bag. We reason that having the bag in storage allows us to avoid the cost of producing that bag, so we would give the unsold seed a valuation of $32 per bag if we did not have to pay for storing it and if the stored seed always passed the germination test. Because we do have to pay for storage and because the seed does not always pass its germination test, we have to reduce the $32 figure."

"I see," said Ashish. "As I recall, the accounting department did a big study last year and figured out that, after accounting for the cost of storage and the fact that stored seed that did not pass the germination test had to be discarded, the correct valuation should have been about 50%–55% of the original $32, depending upon the hybrid. All in all, I think $16 is conservative and reasonable."

"Sounds good to me," said Snodley.

Exhibit 1. Production Costs for Seed Corn in North America

Description of cost	Cost (US$)
Field preparation (prior to planting)	$200/acre
Seed costs (cost of producing/purchasing parent stock seeds)	$500/acre
Planting costs (fuel, labour, equipment depreciation, etc.)	$150/acre
Silvicultural costs (weed control, fertilizer, etc.)	$350/acre
Land rent	$200/acre
Processing costs (harvesting, drying, shelling, sorting, testing, bagging, etc.)	$12/bag

Source. Company materials.

Exhibit 2. Production Costs for Seed Corn in Chile

Description of cost	Cost (US$)
Field preparation (prior to planting)	$200/acre
Seed costs (cost of producing/purchasing parent stock seeds)	$500/acre
Planting costs (fuel, labour, equipment depreciation, etc.)	$150/acre
Silvicultural costs (weed control, fertilizer, etc.)	$350/acre
Land rent	$200/acre
Processing and shipping costs (harvesting, drying, shelling, sorting, testing, bagging, etc.)	$20/bag

Source. Company materials.

Assignment Questions

1. This case focuses on a business situation where the yield from a production process is uncertain. Beyond the agribusiness industry, what other industries would face this situation?

2. Suppose that Suncrest could produce this seed only once, in North America. What is the optimal acreage it should use? What is the expected profit at this acreage? What is the service level (probability of meeting demand)? See Exhibit 1 for costs.

3. Now consider the opportunity to produce the seed a second time in Chile.

a. Intuitively, would you use a smaller or larger acreage in North America?

b. What is the optimal production in North America? What is the optimal production policy for South America? A simple (and optimal policy when the demand is known) policy for the Chilean production is a linear form ($b \times y$), where b is a constant and y is the unmet demand after the production in the North American fields. Choose the optimal value of this constant. Use the costs in Exhibits 1 and 2.

c. What is the benefit of sequential production in (i) dollar terms and (ii) service level?

4. Advanced analysis: Snodley observed that the demand for some seeds was uncertain. How can one modify the solution developed for the random demand case?

5. Advanced analysis: Suncrest may not always be able to get all the land it needs in Chile, especially if it waits until after the yield of North America is known. What can Suncrest do to mitigate this risk (of non-availability of enough land in Chile)?