Title

The Desert Spiral Initiative

Author

Howard Gaukrodger

What stage is your story in?

Complete

What is the key climate solution proposed in this story?

Combination of technology and community input with existing and government-proposed methods in Egypt to:

* The sequestration of 1,000,000 tonnes of CO2 by planting 50 million trees in 1,737 spirals across 1,000 km of the Wester Desert, Egypt, with the option of the innermost spirals being crops to sustain a community in the centre of each spiral.

Do you include other climate solutions?

No, this is a complete, self-sustaining solution in the form of a fictitious story.

Story

See following pages

Follow up information

This is a story, not a scientific report. However, based on my research to write the story, I believe the Desert Spiral Initiative is capable of accomplishing the goal of sequestrating 1,000,000 tonnes of CO2 per year when the trees are mature (10 years). I believe this is feasible as a result of the *combination* of:

* proven, existing technologies
* the desire of the Egyptian government to:
  + re-green the Sahara, to expand habitable land, reduce the country’s dependency on imported grain, to construct and/or complete massive engineering projects (Toshka, Qatarra) and to win foreign investment,
* the involvement of the community (all classes, races, religions)
* the recognised global need to plant trees and the support such projects attract
* the rewards for Egypt and the world of even partial success of the Initiative.

How did you find out about it?

I’ve been interested in the idea of re-greening the Sahara since childhood. When I learned of the aquifer beneath the desert many years ago, I was so struck by the discovery that the knowledge remained with me. It is purely serendipitous that I should be invited to contribute a story on climate change mitigation at the precise and convenient moment of having just finished my first novel on the subject, and that I should choose the topic of re-greening the desert of Egypt when the next COP conference is to be held in that country this November.

Sources

See appendices

How confident are you in your judgement?

I’m confident. However, it’s up to the scientific community to judge its feasibility. I believe the strength of the Initiative lies in involving desert communities and attracting new residents to move to the self-sustaining houses in the centre of each spiral.

What can the reader do to progress this idea? How we can get from where we are now to the ideal outcome. Who/what is required to get to ideal outcome? (policy, finance, research?)

I believe readers should find a way of encouraging the relevant parties to:

* circulate details of The Desert Spiral Initiative in order to gauge interest
* promote the Initiative to decision-makers and communities in Egypt and countries investing in Egypt and its Western Desert-based infrastructure
* encourage the construction of a single spiral (following the concepts in my story) for proof of concept
* ensure accurate information on existing and proposed irrigation projects that would be of significance for The Desert Spiral Initiative (e.g. Toshka canals, New Valley Project)
* invite multiple feasibility studies
* compile a budget with/without foreign investment for 1, 10, 100, 1000 spirals, with/without access to canal water (i.e. using the Nubian Sandstone Aquifer System)
* determine the parties (domestic and international) that would be interested in participating in the construction and planting of the spirals
* assess how local communities can be involved (e.g. by building residences and/or utility buildings and/or a mosque, etc.) in the middle of the spirals
* consider how communities residing in the spirals can be compensated for tending the trees and crops in the spiral(s).
* identify and promote the benefits of I) the trees and crops grown in the spirals for domestic and international markets, and ii) the production of solar power.

The determination of who/what is required to get to the ideal outcome is a scientific and socio-political project in its own right. I don’t have the means to answer this.

Story and appendices (2) follow on next pages.

**The Desert Spiral Initiative**

by

Howard Gaukrodger

**The Desert Spiral Initiative**

Zdan was working extra hard this season, keen to impress his wife, desperate to feed the family. Meagre crops of beans, magaria, dates, figs and olives enriched their *aysh*, but harvests were pitiful. And even when they treated themselves to a shank of goat meat, Zdan knew what Tasa was thinking.

*Thank you, God, for this precious food. Thank you, husband, for tilling the soil that has made such sustenance possible... but this is no life for our son. Aksil is worthy of responsibility. No family will offer their daughter in marriage to a farmer of goat dung.*

The only solution was for Zdan to leave, to travel away from their dusty, clay-brick home and find well-paid work in Cairo. For Aksil to advance his education in the city, he would need money for food and accommodation. Zdan had to go.

"Husband, we do not want you to leave, but by God's grace, Aksil can tend to our crops, and I can clean our house and herd our goats. But stay away too long, and our crops will die, the goats will starve - and we will follow."

#

With the arrival of the new moon, Zdan found himself in Cairo, six hundred kilometres to the east. It was a difficult first day.

"May your body be infested with the fleas of a thousand camels!" he cried.

But the thief, no taller than a donkey's hind leg, had already faded into the fog of the market throng. Zdan was unaccustomed to the chaotic life of the city. Counting his money in a public place had proved a woeful mistake. His family's savings were gone, and with it his means of survival.

With only a crust of bread and dried fruit in his bag, a moment of foolishness had condemned him to the life of a beggar. How could he ask for a job when he smelt like the arse of a pig? Squatting with his back to the sun-baked wall, he winced at the shame he had brought upon his family. He sought consolation in his inner thoughts, but the pain was too fresh to be tempered. His head fell to his knees and he wept. For a time, self-pity sheltered him from the roiling crowds, the blaring horns and the dusty streets. But then he heard the *muezzin*'s call to prayer - a chant that discovered within him one final drop of resilience. The afternoon *asr* was sacred. His spirit was not yet broken. He would not allow himself to be doomed to *Jahannam*. Turning to face the *Qibla*, he recited his prayers. And there, in the rat-infested gutter of a cluttered city street, Zdan's life changed.

#

It was the scent. Bitter-sweet. Different. Expensive. It hung in the air, stuck to the dust, crept up his sandy, sweat-stained *haik* and made its home in his scruffy, black and white turban. So out of place was this scent that Zdan put aside his sorrows and peered up. Against the diffused sunlight of the yellow sky, the silhouette of a tall, well-dressed man arched over him. Without words, the silhouette proffered a bladder-flask of water. Zdan accepted the gift. Now, he was indebted to the silhouette.

"Brother," said the silhouette, "I need workers. There is strength in your shoulders, and now I see endurance in your weathered face and honesty in your eyes. Come walk with me. I travel to Aswan tonight. Join me and I will assure you of a job that will support you and your family, God willing."

Zdan looked to the sky and cried, "Allah be praised!"

#

A year had now passed since Zdan's arrival at the silt-panning labour camp in Aswan. The silhouette with the patent leather shoes and bitter-sweet aftershave was long gone, his task of finding cheap labour complete. He had honoured his word and had given Zdan a job, but the work was a mere scorpion spit from the depths of slavery.

For the second time, Zdan had suffered the pain of naivety. He and his band of rag-tag workers were just one *raht* in a crawling army of sunburnt panners, sifting for gold in the silt of the Nile. With his one year of seniority, Zdan was now spokesman for his group, but everyone answered to the camp's leader, the *zaeim*. And no one was immune to the *zaeim's* fits of rage and the whip of his bootlicking henchmen. But Zdan was earning money, and would soon have enough to travel home. He could give his family the money he'd lost and a heavy purse for his son's education. The day came and the *zaeim* called him to his tent.

"Brother," said the *zaeim*, "here is your money."

Zdan counted the torn and muddied notes. "Brother, this is only half of what I am due."

"Be grateful for what you receive. The rest you will have on your return."

That evening, before the sun dropped over the horizon, Zdan wandered up the west-facing hill overlooking the camp. From the wind-carved ledge of a diamond-shaped rock, he reflected on the scene below. Discarded silt lay drying in circles, protecting the workers within. Plants grew in the semi-dry, brown piles, firm enough to support life, wet enough to nourish it. He smiled. *If only the Nile ran through Siwa*.

With night but a whisker away, he clambered down, praying his sandals would hold. Tired from his labours and the arduous walk, Zdan paused and took a breath. As he looked up, he was struck by a family of spherical, red clouds drifting north. *Balloons! How peaceful. One day, I will buy Aksil a ride in the greatest balloon of all!*

Despite his half-share wage, Zdan slept well that night - thoughts of his family uppermost in his mind. Within 24 hours he would be able to embrace them.

#

"Dear husband, I know you will be sad, but your son has left home."

After her greeting, these were Tasa’s first words on his return to Siwa.

"We have little food, and our land is poor. He has turned 18 and vowed to earn money for our family. Only last week he left for Cairo to seek work in the world of tourist hotels."

Zdan was distraught. A year of hard labour, and now his son was gone. While tears fought with his pride, he knew it must have been worse for his wife. He'd taken their savings and they'd thought him dead.

#

The moon waxed and waned, but Zdan never seemed to finish tilling and planting. He had hoped to till the strips of land quickly, so he could leave to find his son and give him his silt-panning earnings. But the ground was exposed, rock-hard, unforgiving. Wind-blown sand smothered the seed beds, or broke the shoots.

"Tasa," he said, one morning. "It is a sin to sit on the money I have earned, when we could use it for the benefit of many. I have an idea. We will invite our friends and members of the local community to join us in a project of mutual benefit."

His wife looked at him, eyes wide. They had never been close to their neighbours, and this far from the Siwa mosque, the local community was as real as the mirage of wealth.

"And what is this project?" Tasa asked.

"It is a crop spiral! The outer rings will protect the inner rings. I saw such a thing in the work camp, though it was *us* that the mounds of discarded silt protected!"

Tasa nodded slowly, her husband’s wisdom a shining light in a barren landscape.

#

"Keep going!" Zdan cried to the tractor driver. "One more circle!"

And before the sun had set, the final ring of the massive furrowed spiral was complete. The land that would have taken Zdan's family two months to till by hand was ploughed in one day by the tractor. And for the loan of the tractor and plough, he had paid just two goats.

"Ahmed," he said to the tractor-owner, "I do not know where you obtained this magical plough, nor why it is called a ‘dolphin’, but God thanks you, I thank you. As agreed, I will pay you the equivalent of six goats if you will plough the land of our neighbours."

#

Within the following week, Zdan and Tasa exhausted their stock of goat dung, lining only the first ring of the spiral farthest from the well.

"Our fertiliser is gone, Zdan. We need a hundred more goats to fertilise all this circle."

"Or the silt of the River Nile."

"You talk in the riddles of a charlatan," Tasa smiled

"Forgive me. Let us go inside. We will wash, pray, and I will share with you the details of what I learned in Aswan."

#

The local community worked tirelessly as a team to finish sowing and irrigating their crops in mysterious spirals. Finally, Zdan was free to leave for Cairo to search for their son. Once there, he trudged from hotel to hotel asking after Aksil. Occasionally, a receptionist would look at him with disdain, as though saying: *'Goat-herder from the desert. What's he doing here?'*

But in one hotel, a lady of evident sophistication overheard the exchange at the counter and approached the modest farmer. She introduced herself as *'Beatrice'*, and a conversation ensued which consumed Zdan's thoughts as a starving man might consume a leg of freshly roasted lamb.

"Crop spirals, community ploughing, goat dung fertilizer... and such a small amount of water. Fascinating!" said Beatrice.

"Mm," replied Zdan.

"*Eh bien,* I am very interested. Perhaps, if it is convenient for you, we could travel back to Siwa, and you can show me how your trees and plants are growing."

"It would be an honour," said Zdan.

"Oh, and I would like to bring with me a colleague. He also works for the Trans-Sahara Climate Mitigation Organisation. He has a lot of contacts and perhaps he could help find your son."

#

The bus ride was perhaps a little uncomfortable for the French lady in her tailored clothes, but she was humble enough not to complain.

"*Magnifique!*" exclaimed Beatrice, as she inspected the family's crops. "And you planted these crops and trees just five weeks ago? *Magnifique!*"

The next time that Zdan heard from the lady was when a courier arrived with a letter. Without access to the Internet, the family customarily relied on the relay of spoken messages, or at most, a written note. A courier message heralded either something very good, or something very bad.

*'Dear Zdan, I have explained your farming technique to my colleagues, and have shown them pictures of the results. They are very interested in meeting you in Cairo. Your combination of using the so-called Delfino Plough, the crop spiral, and, most intriguingly, your proposal to use river silt as a fertilizer has made a considerable impact. We believe we could build on this with modern technology and use it to plant millions of trees. We will, of course, refund all costs of your journey, and board and lodgings...'*

But while this news was important, it was the next paragraph that really excited Zdan.

*'… We also have news of your son. My contact tells me he was indeed here in Cairo. It seems he worked for a short time at the Hotel Great Sands as a kitchen-hand. Regrettably, he moved on and we have no further details.'*

Within 24 hours, Zdan was heading back to Cairo, this time on a train. Tasa had trimmed his hair and beard, insisted he wear a fresh headscarf and traditional *haik*. She sensed this was something big and they could not lose face.

Having visited the Hotel Great Sands and confirmed the information provided by Beatrice, Zdan shuffled off and booked a room in a poorer quarter of the city. The following day, he went to meet the 'climate lady'.

"Good morning, Zdan! Welcome. A glass of water, perhaps? Let me introduce you to my colleagues and business partners..."

Zdan was dumbstruck. Before him was not only the lady he'd gone to meet, but a roomful of businesspeople and politicians. He sat, as a fresher might sit amid a roomful of Harvard professors.

"... We've been discussing your method of planting..."

Beatrice talked for several minutes. By the time she’d finished, Zdan thought they were going to re-green the whole of the Sahara.

"I am honoured you find my idea so interesting. But I am unclear..." he started.

Several men in the room grinned, and debate continued, entirely ignoring the farmer from Siwa. It was only when Zdan risked raising his voice to contribute a bold, new idea that he attracted full attention.

"Air balloons?" one of the financiers responded. "You want to float air balloons across the desert and drop silt from the basket?"

And then everyone wanted to talk at the same time.

The spokesperson for the Ministry of Agriculture and Land Reclamation banged the table. "The idea may not be as far-fetched as you think. According to my advisor, here, there are powered airships that can carry up to 160 tonnes of cargo. If this cargo happens to be silt that has been dehydrated by, say, 80% to 32 tonnes, then such a vessel could carry the equivalent of 800 tonnes. And we can fertilise many spirals with that."

"Navigation? Altitude? Accuracy of the drop?" asked the representative of the Ministry of Water Resources and Irrigation.

"Yes, there are things to work out, but with GPS navigation and a flexible pipeline, it is not impossible," said the former spokesperson. "But how can we irrigate these spirals, and where should they be located?"

Beatrice leaned over. "*Ecoutez.* Listen Zdan, you may wish to leave now. We have much to discuss. If you go to reception, you will find an envelope waiting for you. I will contact you this evening."

Zdan stood, nodded to the group, then went to collect the envelope. Inside was a mobile phone, a receipt for the advance payment of three nights' accommodation at Beatrice's hotel and a note: *'I believe your ideas will prove to be worth far more than the cost of a phone and accommodation, but please accept this as a token of our appreciation. Regards, Beatrice.'*

#

At 8.30, next morning, Zdan was back in the hotel lobby. Beatrice arrived and smiled with an air of complicity.

"We have a breakthrough, Zdan! Let me update you before we go to the conference room. The Ministry of Water Resources and Irrigation, the European Investment Bank, and all the other parties recognise the merit of your idea, and all agree that we should develop a proof-of-concept model."

Zdan placed his hand across his heart. "Allah be praised."

Taking a map of Egypt from her case, Beatrice continued. "Rather than reinvent the wheel, our proposal involves combining existing projects and technology with your ideas. We’ve called it the Desert Spiral Initiative.

"We will plant a chain of 550-metre spirals across the desert, enough to green the desert for a thousand kilometres! It will run from the Toshka lakes to the Farafra Oasis.

"An airship will be used to drag a weighted tow-line connected to a Delfino plough to create the rings. Dehydrated Nile River silt will be channelled into the furrows by a hose from the airship. Finally, drones will fire pods of fertilised saplings into the tilled soil and rehydrated silt bed.

"For irrigation, we propose a network of small wells, extracting water from the New Valley Canal and the Nubian Sandstone Aquifer - one well per ten kilometres. Well-water will be pumped using solar energy. One of the many advantages of your idea, Zdan, is that it will use only a fraction of the quantity of water that lineal and random planting use. And it’ll take only 3-6 days to plant one entire spiral! Imagine how quickly we can transform the desert – 1,737 spirals to plant 50 million trees! A million tonnes of CO2 gone! Egypt will be the envy of the world!"

"*Inshallah*!" said Zdan. "But your ideas are too complicated for me. I see I am no longer needed and shall continue the search for my son."

"Very well, Zdan. But allow me to give you this document. It is a summary of the project for discussion at the meeting this morning."

Zdan glanced at the paper.

|  |  |  |  |
| --- | --- | --- | --- |
| **The Desert Spiral Initiative** | | | |
| **Spiral** |  |  |  |
| No. of furrows (rings) in spiral | 50 | rings |  |
| Width of furrow | 1 | m |  |
| Depth of furrow | 0.40 | m |  |
| Space between furrows (centre to centre) | 5 | m |  |
| Outside diameter of spiral | 550 | m |  |
| Inside diameter of spiral | 50 | m |  |
| Length of one entire spiral | 86,350 | m |  |
| Area of spiral (to be fertilised and irrigated) | 86,350 | m2 |  |
| Tractor-pulled Delfino plough: time to till one spiral | 17 | hours | est. based on 5 kph |
| Airship-pulled Delfino plough: time to till one spiral | 9 | hours | est. based on 10 kph |
|  |  |  |  |
| **Location / Route** |  |  |  |
| Lake Nasser to Farafra (New Valley Project) | 1,000 | km |  |
| Spirals spread along the 1000km, creating self-sustaining wall. |  |  |  |
|  |  |  |  |
| **Silt Fertiliser** |  |  |  |
| Depth of fertiliser (dry, assuming 80% dehydration.) | 0.05 | m | dehydrated |
| Total dry silt fertiliser needed for 1 spiral | 1,800 | kg | (0.6kg / m2) |
| No. of airship flights to fertilise 1 spiral | 1 | flight |  |
| Max. duration of airship flight sustainability | 120 | hr |  |
| Max. duration of drone flight sustainability | 0.75 | hr |  |
| Max. cargo of drone | 226 | kg |  |
| No. of drone flights to fertilise 1 spiral, if this option chosen | 8 | flights |  |
|  |  |  |  |
| **Irrigation** |  |  |  |
| New Valley Canal and NSAS aquifer beyond canal |  |  |  |
| Solar energy for power and self-sustaining water system |  |  |  |
| Crop circles with drip feed. Estimated use, 1 drop / 5 seconds: | 0.89 | litres | / tree / day |
| For 1 spiral of 28,783 trees | 25,617 | litres | / spiral / day |
|  |  |  |  |
| **Trees** |  |  |  |
| Saplings dropped by drone (1kg ea) per flight | 226 | trees |  |
| Weight of sapling pod | 1 | kg |  |
| No. of drone flights to plant 1 spiral | 127 | flights |  |
| CO2 sequestration per one 10-year-old tree | 20 | kg |  |
| CO2 sequestration per spiral per year after 10 years | 576 | tonnes |  |
| Sequestration target | 1,000,000 | tonnes |  |
| **Trees per spiral (assuming 1 tree / 3m)** | **28,783** | **trees** |  |
| **Spirals required** | **1737** | **spirals** |  |
| **Trees needed to offset target** | **50,000,000** | **trees** |  |
| **Time to plough, fertilise and plant 1 spiral (fastest method)** | **6** | **days** | **(inc. 3d contingency)** |
|  |  |  |  |

"My friend, where are the people? This project is for the whole of Egypt: farmers, nomads, people of every race and religion."

"But Zdan, this document is for the decision-makers, our leaders and investors…"

Zdan roared, "It is for the people! It is *they* who will make it a success! Build a house, or a whole village, in the middle of each spiral… and a mosque, classroom, or medical centre, every one hundred spirals. The people will tend to the trees, and in exchange, they will have free power from the sun and free food and lodgings."

Beatrice was stunned. She didn’t expect this outburst. Yet, she had to admire him. The need to attract people away from the Nile to inhabit the desert was an ambition that many a president had expressed.

"I will put your ideas forward at the meeting, Zdan."

The wise farmer nodded and turned towards the door.

"Farewell, Zdan. I’m sure we will meet again. *Bonne chance* in finding your son."

#

It didn't happen overnight, but Egypt and the world needed the project to go ahead. At the press conference just eight months later, a letter of intent was presented with all project details. It included the final ideas so forcefully put forward by Zdan. His name even appeared in the report, and in due course, he would be recognised as the innovator of the Desert Spiral Initiative.

With Zdan’s renown spreading throughout the country, it was almost inevitable that Aksil would one day read about the project and come across his father’s name. But only when he’d earned sufficient money for his parents to be proud of him did he travel home to Siwa. And he was not alone. While he had found a permanent position at a hotel in Luxor, he’d also found a young woman by the name of Sakina. And one year to the day since Aksil had left home, the family celebrated their marriage. Their reputation was growing, and so was that of Egypt.

Airships

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