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Making Money after Mining: Farming on Rehabilitated Open Cast Mines

by **Teresa McNeill** and **Emmanuelle Quillérou**

In Brief

Open cast mining causes huge amounts of physical damage to the geology of the land, which has direct implications on the extent to which it can be used after the ore has been extracted. In South Africa, mining companies are required to submit rehabilitation plans before permits are granted, but the guidelines they must follow are often loose and do not take into account how the land was used before mining took place. Generally, mining companies plan on returning land to grassland within three to five years, without recognizing that restoring a sustainable, healthy, mixed farming community can take decades. By pushing for accurate feasibility studies before mining commences, mining companies and communities can get a true sense of the cost of open cast mining and what a just and sustainable approach to the industry might look like.



Randfontein Mine, Johannesburg.

South Africa is a commodity-based economy, with the mining sector not only a cornerstone of the economy but the very foundation on which the nation was built. Directly and indirectly, mining nominally contributed to 17 percent of the country's gross domestic product in 2012.¹

Both deep-level and open cast mining are used in South Africa to exploit various ores. The overburden (i.e., the rock, soil, and ecosystems that lie above an ore body or coal seam) often takes the form of high-potential agricultural land,² concentrated according to the uneven rainfall distribution and which often overlaps with ore bodies.

Open cast mining not only causes a great deal of physical damage to the land, as seen in Figure 1, but it can also cause chemical damage.^{3,4,5} This damage has the potential to be long term and irreversible, and while this could imply that post-mining

Key Concepts

- Mining companies in South Africa are required by law to rehabilitate land after open cast mining, but this rarely leads to farming communities on affected lands being fully compensated.
- Feasibility studies by mining companies must recognize fully communities' lost agricultural revenue potential so stakeholders can develop a sustainable and just approach to open cast mining.
- Estimates of farming revenue from former mining sites after rehabilitation would help inform the planning of prefeasibility studies, grant locals bargaining power, and lead to long-term community engagement by mining companies.

agricultural activities might not be profitable, to date, there is no evidence to support this.

Since the 1980s, statutory requirements for the granting of mining licenses in South Africa have become increasingly stringent.^{6,7} Environmental Impact Assessments and Environmental Management Plans have become integral parts of the mining license application process, and must be budgeted and planned for. The definition of the degree to which land must be rehabilitated remains loose, however, and thus open to interpretation. The Mineral and Petroleum Resources Development Act of 2002 contains no definition of what is considered to be a 'natural' or 'pre-determined' state.

Rehabilitation plans for open cast mines usually involve the replacement of (degraded) topsoil and a grass seed mix, which must then be maintained for only three to five years. In comparing agricultural areas and mining areas, the main mining areas are to be found in what is predominantly maize and sugar cane farming regions.



Paul Saad



Emmanuelle Quillérou

Figure 1. Open cast mining in South Africa as visible from the sky in September 2013.

Environmental Impact Assessments do not require that the type of grassland to be mined is categorized as natural grassland or cultivated pasture. The fundamental difference between the two types of pasture are the yields of dry forage matter for cattle consumption, which in turn affects the number of cattle that can graze on the land, as cultivated pastures have a higher potential density of cattle. Mining companies typically only restore exploited land back to pasture-standard, without recognizing the lost revenue that the land would have earned had it been returned to cultivated purposes. This

helps to explain why prefeasibility studies involving a comparison of mining versus non-mining economic returns usually come out as more favorable for mining.

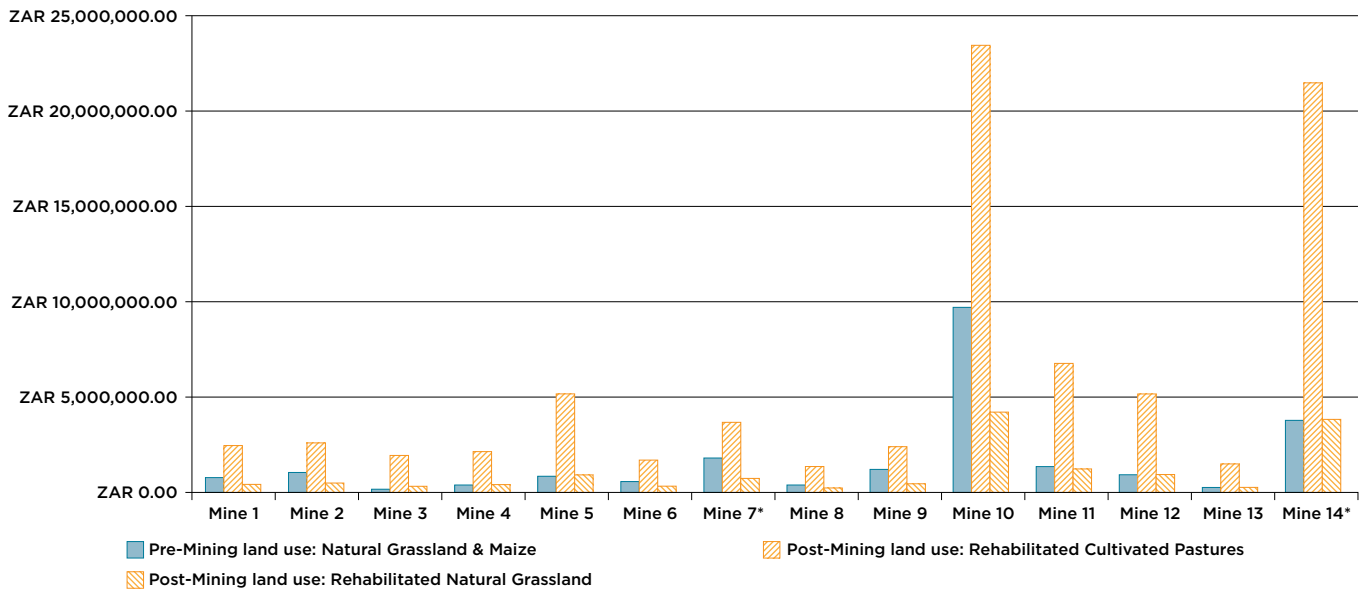
One way to create a better outcome from open cast mining is to ensure that land is accurately valued for lost revenue. This starts with a simple formula, such as:

Farming revenue in baseline year = Yield * Price * Hectarage

This formula is then multiplied by the years of the mine's life and the planned rehabilitation period. This is applied to pre-mining farming activities

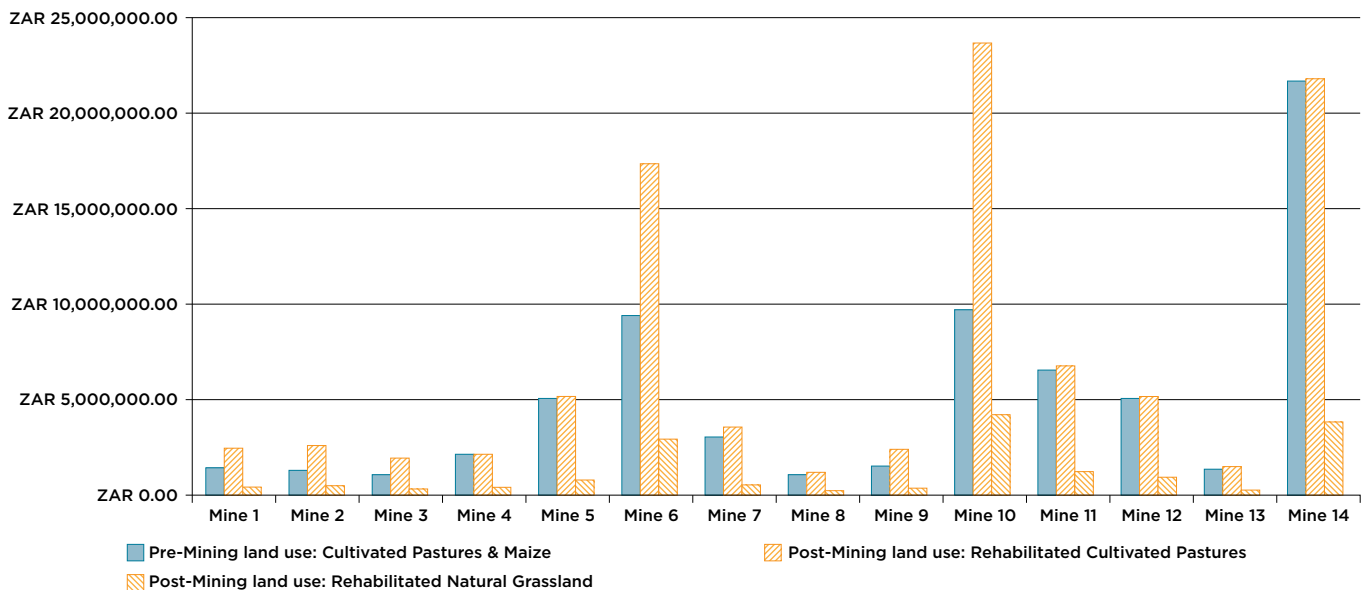
so as to estimate lost revenue and compare it to similarly estimated revenue from post-mining farming activities. Furthermore, to ensure estimates are comparable in time, baseline revenue estimates are projected using the GDP deflator index up to and including 2013.⁸ An average of the index is used for projections beyond 2013.

Although this approach remains theoretical, studies indicates that where pre-mining natural grassland was improved to cultivated pastures post-mining, the potential increase in revenue can be very large. On the other hand, if left to revert to natural



Authors

Figure 2. Farming revenue estimates for a pre-mining combination of natural grassland and maize, compared with post-mining cultivated pastures and with post-mining natural grassland.



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Figure 3. Farming revenue estimates for a pre-mining combination of cultivated pastures and maize, compared with post-mining cultivated pastures and with post-mining natural grassland.

grassland—that is, if the rehabilitation program was discontinued—revenue potential could be almost halved (Figure 2).

Where pre-mining agriculture was a combination of cultivated pastures and maize, the revenue potential using the land only for cattle grazing on continually rehabilitated land was

more conservative, with much smaller increases. If left to revert to natural grassland, however, the losses were more severe: less than one third of the original pre-mining estimate, and sometimes even less than one quarter (Figure 3).

This shows that assessing the level of potential farming returns at a future

mining site, derived from land once mining operations cease and land is rehabilitated, is not an exact science. Estimating such farming returns, and more specifically the potential level of lost farming revenue, could help mining companies better determine the minimum level of efforts and investments required for land rehabilitation.



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Wollastonite mine near Garies, South Africa.

Mining companies' obligations should not stop there. There is clearly a fundamental need for the quality of the rehabilitation to be maintained in order to benefit the post-mining farmer over the long-term, and this speaks to property rights. When land is purchased in advance of a mining rights application, and the farmer is a tenant until mining commences, he may not necessarily be considered in the public consultation process.⁹ This means he may not be privy to crucial information he would need when returning to farm the land once mining has ceased.

This has implications for the mine-planning process, more specifically with regard to the rehabilitation plans, budgets, and the public consultation process. Sharing such information at the public consultation stage could allow for a collective and long-term rehabilitation strategy that would

involve ongoing active community engagement and a sustained involvement in the rehabilitation of the land.

It would be easy to assume that the communities are well versed in the nuances of the impacts that such land disturbance has on farming. Consultations should therefore include an education program that would assist the community in understanding the rehabilitation process, how it works, and how the potential for improved revenues can be maximized.

One of the key results of the study is the need for ongoing rehabilitation for improved revenue streams with post-mining farming, and so budgets would need to be set aside in order to continue the rehabilitation. As rehabilitation occurs on a rolling basis throughout the life of the mining, the opportunity exists to set aside funds on an ongoing basis as mining continues,

as well as into the future. Coupled with improved knowledge within the community, not only will the mines develop a closer relationship with their communities, but their corporate social responsibility will ensure an ongoing and sustained duty of care. **S**

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David Brossard

The Kimberly Diamond Mine Museum in South Africa. This is where diamonds were discovered in 1879. De Beers eventually stopped mining the pit, which was allowed to fill with water, and dug shafts down into the diamond-bearing rocks below. They stopped mining altogether in 1914. This site is now part of the museum.

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REFERENCES

1. Facts and Figures 2012. Chamber of Mines, Johannesburg [online] (2014). <https://commondatastorage.googleapis.com/comsa/facts-and-figures-2013.pdf>.
2. van den Burgh, G. The impact of coal mining on agriculture—a pilot study. South Africa: Bureau for Food and Agricultural Policy [online] (2014). <http://bfap.co.za/documents/presentations/2012/Impact%20of%20Mining%20Presentation%20-%20BFAP.pdf>.
3. Tiwary, RK. Environmental impact of coal mining on water regime and its management. *Water, Air and Soil Pollution* 132, 1–2 (2001).
4. Xuizhen, T et al. Effect of acid mine drainage on a karst basin: a case study on the high-As coal mining area in Guizhou province. *China Environmental Earth Sciences* 65, 3 (2012).
5. Zhengfu, B et al. The impact of disposal and treatment of coal mining wastes on environment and farmland. *Environmental Geology* 58, 3 (2009).
6. National Environmental Management Act. The Presidency, South Africa. Act 107 of 1998.
7. Mineral and Petroleum Resources Development Act. The Presidency, South Africa. Act 28 of 2002.
8. Inflation, GDP Deflator (Annual %). World Bank [online] (2014). <http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG>.
9. Nieuwoudt, H. Personal communication, 2014.