RECOMMENDATION FOR MITIGATING HIGH FERTILIZER PRICES FOR CROP PRODUCTION IN SOUTH AFRICA

Grain SA's CEO Dr Pieter Taljaard, stated at the Fertasa Congress held in April 2022, that the only way grain production and especially maize, could continue to be profitably produced in South Africa is when climatic conditions are very favourable, grain prices are high and fertilizer prices are kept under control.

Dr Pieter Taljaard

The consecutive bumper agricultural crops over the past four years, with record yields and high grain and other produce prices, were extremely valuable to South Africa's GDP and helped reaffirm Agriculture and the fertilizer industry, amongst the other agricultural input industries as "essential" services. The concern of Grain SA, however, is that the massive increase in fertilizer prices currently experienced will render this essential industry unprofitable.

Fertilizer comprises approximately 30 to 40 % and higher of the input costs in maize production according to Grain SA. This emphasises the importance of ensuring the efficient and effective usage of fertilizer, especially with the current exorbitant prices for this essential input. Grain SA has requested that Fertasa and its members should urgently evaluate the current situation and make appropriate recommendations.

This was done during and after the Post Fertasa Symposium Workshop held on the 25th of August 2022.

Prof Robin Barnard

Fertasa was very fortunate to have gained the insights of world-class scientists who have shared their knowledge and expertise in managing this crucial aspect of crop production with its members and other scientists during the symposium and follow-up workshop.

The following was compiled by Prof Robin Barnard and Dr Pieter Haumann with editorial input from Dr Koos Bornman and inputs from the panellists consisting of Dr Chris Schmidt, Corné Louw, Dr Louis Ehlers and Kobus van Zyl.

Recommended Action with rising fertilizer and other input costs

General

1. Be scientific with all actions – Technical Science, Economic Science, Social Science.

2. Rely on basic actions, proven in the past, and build on those, with new science and development

3. A fertilizer recommendation is an integrated process, adapt such to all existing and new agronomic practices, which should be optimized as far possible e.g. – cultivation, weed and disease control, rotation, calibration of equipment, crop, and cultivar selection. Also make sure of past agrochemical applications (products, rates and timing). Choose your advisers wisely.

4. The 4R concept is a reliable and often recommended framework within which a fertilizer recommendation may be evaluated.

5. Ensure that the inherent soil fertility is adequate to support optimal crop production. Address carefully identified deficiencies by means of broadcast and/or banded fertilizer, according to sound scientific data (e.g. use of production functions and current price ratios). Under current economic conditions banding higher levels of nutrients (feeding the plant) instead of soil "build up" (feeding the soil) is advised

6. Quantify the possible monetary result of all possible actions – i,e expected rate of return and margins. The latter two concepts should be well understood and not confused. Recall, measure, evaluate, record, store, share.

7. Use reliable, historic published data and, if available, preferably as recent as possible site-specific data. Published and of course own site-specific developed response- or production functions are invaluable.

8. Internalize above mentioned concepts as well as "risk quantification", "climate forecasts" and "remote sensing" for planning and implementation. Precision farming practices and resultant data are of the essence to support the above.

9. Keep nutrient interaction (synergy and antagonism) in mind.

10. Be proactive in existing and future cooperative learning, experience sharing and data collection activities.

11. Specifically relating to fertilization:

    11.1 <u>Liming</u>

    First and foremost, the pH of the soil must be near to optimal levels for nutrient uptake. The ideal pH (H_20) is 5.5 – 7.0). In highly buffered soils liming to an exchangeable acidity level of zero should be the objective. If the mentioned conditions are not met, remedial liming is paramount.

    Under current economical conditions where capital is probably constrained in most cases, shorter liming cycles should be considered (Smaller amounts of good quality lime more often and/or optimal liming of smaller land parcels). Refer to published production functions such as from Grain SA, and the current price ratio to determine optimum liming cycles.

    To eliminate liming as a cost-saving measure can prove catastrophic and has in fact, and continues to be, the most important yield limiting and profit depriving action in crop production, in particular with reference to maize in South Africa.

    NB! Liming cannot replace fertilization. Both are essential to enable optimal crop production.

11.2 Nitrogen – Fertilization is for the crop, not the soil.

- Use published production functions and the current price ratios per crop as far as possible. Cross-check with trustworthy published nitrogen removal rates of the crop.
- Classic and reliable published production functions show that productivity (yield) is less sensitive to reduction of nitrogen application rates near the economic optimum. Some cutting back on nitrogen level could be a prudent action under current economical conditions. For example; using historic production functions of maize on a medium textured soil near Nigel, using the current price ratio, a saving of R1000 ha^{-1} will probably result in yield value loss of R300 ha^{-1}. The economic optimum application with the current price ratio is 50 kg ha^{-1} less than the FERTASA guideline (2016).
- Nitrogen soil analysis pre-plant and plant chlorophyll sensing with related validated algorithms will enhance nitrogen use efficiency.
- Be critical about the rate used – indications are that in many cases excess nitrogen is given, as historic low price ratios were used to compile current recommendation guidelines. Price ratios as for example; nitrogen cost to maize value have more than doubled over the last two years.
- Bear in mind factors such as risk mitigation, profitability and realism.
- Be careful with pre-plant sources of reduced nitrogen – a major danger for soil acidification. Do not apply deeper than 150 – 200mm. Consider using nitrification inhibiters to control N- efficiency.

- If at all possible, top dressing with N will be beneficial (up till 11 leaf stage for maize). Topdressing allows management of risk within season, especially if tissue nitrogen is monitored by e.g. chlorophyll sensing.

11.3 Phosphorus

Plants generally require relatively small amounts of P – but it must be available when the plant needs it. It must be kept in mind that 60% of phosphorus is taken up by maize after tussling. The build-up of soil phosphorus, as has long been recommended by some, is not to be recommended at this stage. The concept of fertilizing the plant, not the soil is gaining ground.

Applying adequate rates of phosphorus in the plant row at moderate soil phosphorus levels is recommended. Expressing soil phosphorus as kg ha^{-1} allows economic evaluation by means of production functions and price ratio. Refer to the extensive and published work by the ARC and fertilizer companies where possible.

11.4 Potassium

Again, to ensure a sufficient background and then for the current crop. Soil analysis is essential to determine how much needs to be added. As above, expressing potassium soil analyses as kg ha^{-1} allows for economic evaluation.
Scientific data suggests that potassium application for high yielding grain crop even at high soil potassium levels is economic, due to the high demand at peak growth.

11.5 Other essential elements, biostimulants and growth inhibitors

Evaluate presented scientific data carefully and rely on past experience, if in doubt. Continue with proven and economically evaluated actions and amounts.
Be especially wary of unfounded claims regarding novel products. Stick to peer reviewed published science, statistical trials and relevant site-specific proven results.

12. In Summary
    - Stick to your tested and proven experience and practices. Don't make hasty changes.
    - Adapt and maximize where necessary.
    - Prioritize visual and experimental records for management and information sharing.
    - Adopt historic and realistic new economic production function evaluation for planning and management. The impact of price ratio is especially important under current circumstances. Management of fertilizer requirement per growth phase as related to yield should be accurately evaluated and implemented to develop response data for each land unit.
    - Learn from the past to guide the present and influence/determine the future.

Front: Dr Pieter Haumann Dr Koos Bornman, Corné Louw, Dr Chris Schmidt
Back: Kobus van Zyl and Dr Louis Ehlers