

IN DIALOGUE WITH PROF. GODOFREDO CESAR VITTI



In dialogue with Prof. Godofredo Cesar Vitti

“We have a fundamental difference between the agriculture in Brazil and the rest of the world: Here, it is possible to cultivate 3 times per year and crops are grown on tropical soils. Highly weathered and highly worn, these soils have very low levels of organic matter. This low level of organic matter in connection with the atmospheric conditions leads to intense nutrient leaching. However, in Brazil we mainly have good weather conditions but we do not have good soils. Therefore, the mineral nutrition is much more elaborate.

We have then to initially adopt a no-tillage system, and then make corrective practices, mainly to correct the soil profile. These corrective practices must always include a liming. Secondly, Brazil has the technology to produce triple superphosphate as a source of phosphorus and a byproduct called “Egyptian phosphorus”, which is agricultural gypsum characterized by a high mobility in soil. This agricultural gypsum is applied after liming, in order to increase the calcium content into the depth and decrease the saturation tendency for aluminum. Gypsum does not correct acidity, it enhances the soil structure.



The interview with Prof. Vitti was held by Dr. Daphne Jost, K+S KALI GmbH, Kassel, on behalf of IAPN at the 2nd International Symposium on Magnesium in São Paulo.

Soils in creation

Well, combined with liming and application of gypsum, the third step to efficiently manage soil in Brazil is the application of phosphate. In general, a source of phosphorus, soluble in citric acid, is used to increase its availability and is commonly applied.

It is clear that in Brazil it is initially necessary to create an agricultural system, like the creation of the human being: the formation of the tooth root which is made of tooth. And a tooth consists mostly of calcium and phosphorus. Due to these necessary corrective practices (liming, application of gypsum and phosphorus) it is made possible to plant crops.

The main crop in Brazil is without doubt soybean. We have today almost 30 million hectares (ha) of soybean, just in one season. Concerning the cultivation of soybean in Brazil, we have the technology to produce without much difficulty 4.2 tons of soybeans per hectare. Moreover, soybean production in Brazil costs only half as much as soybean production in the USA.

Crop rotation

We have the technology to produce soy, if the necessary corrective practices are implemented. For soybean, we must mainly apply phosphorus, potassium and micronutrients. In succession to soybeans, we usually cultivate corn, with high yields around 6.6 to 7.2 tons per ha. We have our own technology for the cultivation of corn: the “Santa Fé” system. In this case, corn is planted along with *Brachiaria brisantha* (beard grass). In addition to increasing of soil’s organic matter, this grass also inhibits nitrification. It retains more ammoniacal nitrogen and thereby enhances corn production. After that, we can suppress the grass growth and cultivate corn and bean, preferably under irrigation, and the cotton the year after that.

Fertilization

In terms of mineral nutrition, Brazil has enough technology and know-how. However, most of the fertilizers in Brazil are imported. For example, we import about 60% of the nitrogen, ca. 50% of the phosphate and 95% of the potassium.

As discussed in this symposium, we call the nitrogen, phosphorus and potassium primary macronutrients or “noble nutrients”. This connotation of primary or noble macronutrients gives a false idea that these elements are much more important than others. And we forget obviously the secondary macronutrients such as calcium, magnesium and sulfur.

As discussed before, limestone and magnesium are provided through the practice of liming and sulfur indirectly by the use of agricultural gypsum and the use of simple super phosphate. But the supply of magnesium through the limestone is not enough for the crops in Brazil. Mainly because in Brazil we use limestone from dolomite rocks that has a slow reaction in the soil.

Magnesium gets a raw deal

After liming we use agricultural gypsum that has high mobility in the soil and can lead magnesium to the soil surface. Especially in crops in which the requirement for potassium is high, the need of magnesium is also high. So, for us today, magnesium deficiency is very serious, for example in cotton. Cotton has a disorder that is fully linked to magnesium deficiency.

The reason for this is not a naturally magnesium-deficient soil, but because there is a competition going on with potassium. Thus, you need to apply magnesium in cotton and it is necessary to use magnesium in noble crops in Brazil as coffee and citrus, where the requirement for potassium is high, as in the case banana which has a very serious disorder caused by an excess of potassium. Also tobacco is an important crop with an extremely high magnesium demand. So at that point, magnesium is just as important as nitrogen, phosphorus and potassium.

And, at that point, this symposium called attention to the appropriate use of magnesium. Magnesium is essential for plants because, beyond the production of energy and carbohydrate, it has a pivotal importance for the photosynthesis and it carries carbohydrates to the drain zones i.e. consumption zones as grains and seeds.

As discussed at this symposium, beyond the limestone, we can use more soluble sources of magnesium as double sulphate of potassium and magnesium and kieserite, which is magnesium sulphate. All without bothering to make a foliar supplementation with magnesium, as the cost is very low and the return is high.

We did a quick calculation and specifically in soybean we found that foliar application of magnesium promotes an increase of 0.3 tons of soybean per hectare. If I applied sufficient magnesium throughout the soybean plantations, it could increase the soybean production in Brazil to 9 m tons. A high yield, indeed.

What is the importance of magnesium for the major crops of Brazil?

For magnesium application, there are some plants that need quite a lot of it, such as cotton, coffee, citrus trees, tobacco and in general all grasses, such as corn and rice. This is an important fact, as due to the soils' low potassium content, fertilization with potassium is high. The big problem seems to be the potassium competing with magnesium.

Nutrition in the food chain

It is also clear that the consequences of adequate plant nutrition are reflected in animals and humans. You know that in Brazil larger animals are usually anteaters, wolves. We go to Africa and we see elephants, giraffes. In Asia they have tigers. All of them large animals. In the US, they have the bison. In Brazil, animals are smaller, as a reflection of their plant nutrition. As these countries have more phosphorus and calcium in the soil, animals are bigger. In Brazil we have very little phosphorus and calcium, therefore animals are smaller.

In countries with temperate climates, the major problem is iron. In Brazil we have it in excess. Spain spends € 400/ha to combat the lack of iron in citrus and grapes trees. Brazil has an agriculture that is strongly influenced by intemperate weather, but it has the main component for productivity: mild climatic conditions throughout the year. Along with that, Brazil has developed mechanization in contrast to countries in the temperate climate zone.

Therefore, it is an honor to have had the chance to hold this symposium here in Brazil. I understand that this symposium was a milestone for the proper appreciation of Mg use in plant nutrition and consequently in animal and human nutrition.

At a glance: challenge post-harvest farm

One important thing: One must understand that agriculture has 3 segments: pre-farm, farming and post-harvest farm. The big problem in Brazil is the post-harvest lack of infrastructure. Our agriculture is generally based on trucks and highways for transportation. We do not have effective and fast transportation to the harbors for export. We do in Brazil as the US do, enhancing waterways, such as the Mississippi Missouri System. We need to improve the rail system. The logistics for transport and our roads are poor. Moreover, the major problems are our harbors. We do not have harbors like in Norway, or the harbors of the Gulf of Mexico. We have 2 large harbors in the south: Santos and Parana-gua. They are overcrowded and charge high rates of about \$ 35,000 per day.”