

Analysis of Export to Nepal: AZteroid Fungicide  
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## **Part I: Product Information**

### **Introduction to AZteroid Fungicide**

AZteroid 1.65 SC Fungicide is a group 11 fungicide that was recently developed by Vive



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Crop Protection that has the ability to combine with starter liquid fertilizers without crystallization or clogging of irrigation lines (Vive Crop Protection, 2016). AZteroid is an 18.4% azoxystrobin-based fungicide. Azoxystrobin consists of Methyl

(E)-2-{2-[6-(2-cyanophenoxy) pyrimidin-4-yloxy]phenyl}-3-methoxyacrylate. Azoxystrobin is a systemic fungicide, which means that the fungicide is taken up through the roots then redistributed through the xylem of the plant as well as the leaves. AZteroid fungicide can be applied via in-furrow application or foliar application (Vive Crop Protection, 2016).

### **Field Test Results using AZteroid**

AZteroid fungicide can be used for a large array of different plant species; such as beans, legumes, rice, herbs, fruits and nuts (Vive Crop Protection, 2016). However, since the country that AZteroid fungicide is manufactured in is the United States, it was appropriate to use corn as the test crop for field test results, but it can be assumed that using AZteroid on the crops listed above would yield similar results. AZteroid's field test results show that when applied to corn by foliar application, the disease severity is only about 11% compared to the 22% disease severity of the untreated maize (Irwin et al., 2016). Also, 10.6 more bushels per acre were produced from the AZteroid treated corn crops compared to untreated corn crops. The field test results for corn when AZteroid is applied through in-furrow application yields similar results. Out of 8 trials, 7 of them had increased yields of corn with the use of AZteroid. Even as the stand count stayed the

same with and without AZteroid, the plants still managed to produce, on average, 8.8 bushels per acre more than the untreated corn crops (Irwin et al., 2016).

### Benefits to Canada

Vive Crop Protection is based out of Toronto, Ontario and also has research facilities and biological testing in Guelph, Ontario (Vive Crop Protection, 2016). Having these facilities located in Canada would be beneficial for Canadians, the economy and the company, as having a purchaser overseas could lead to many new opportunities. If the export of AZteroid fungicide to Nepal is successful, then perhaps AZteroid could be exported to other overseas countries. Vive Crop Protection researchers from Canada would need to spend months, if not years, in Nepal to understand the logistics of their agriculture in order to provide the best service possible to the Nepali farmers. In turn, this could possibly extend research, thus having the potential to create more jobs for the Vive Crop Protection research facilities in Ontario. Not only will it create jobs for researchers, but could also create the potential for more research facilities across the country.

### Cost of Product

Currently, AZteroid is being manufactured in the United States. This product is still in the process of being launched, so it is not available for purchase or registered use. When the product is finally launched, it will be up to the retailers and distributors to decide the price, not the Vive Crop Protection company. For other premium azoxystrobin based fungicides, the price that a farmer pays in the United States is approximately 10 USD per acre. In comparison, a generic brand of fungicide typically sells for approximately 4 USD per acre. A simple supply chain for this product looks something like this: manufacturer < distributor < retailer < co-op. The retailer can sell directly to farmers, or sell to an independent co-op first. At each stage of the chain, the

cost of the product will increase significantly, as each level needs to make a profit. This information was contributed by Vive Crop Protection's Kelly Greig; her email is located below.



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to me ▾

## **Part II: Export Potential to Nepal**

### **Introduction to Nepal**

In South Asia, located south of China and north of India, is Nepal. Nepal has an area of 147181 square kilometers and has a population similar to that of Canada: 30 million. The capital of Nepal is Kathmandu (Nepal Embassy, 2016). Approximately 70% of the population of Nepal is engaged in either the agriculture or forestry sector. Agriculture and forestry in Nepal accounts for about 34% of its GDP ("Agriculture and Food Security | Nepal | U.S. Agency for International Development", 2016). Even though so many people are engaged in farming, the country still struggles with food security and this is due to the lack of new technologies, improved varieties and market opportunities ("Agriculture and Food Security | Nepal | U.S. Agency for International Development", 2016). In this section, it will be discussed how AZteroid fungicide could be a possible export to Nepal in the future.

### **Fungus in Nepal**

Fungal infections of crops such as rice and maize are a problem for much of Asia. Rice is the most important crop grown in Nepal, and maize is the most important cereal crop grown in Nepal. Both of their yields suffer due to fungal diseases (Subedi, 2015).

Different strains of *Rhizoctonia* affect many crops around the world. *Rhizoctonia* is more common where there is warm and humid weather, dense planting of crops, and high nitrogen

content in the soil (Taguchi-Shiobara et al., 2016). In Nepal, maize and rice are just two of the crops that are affected by this pathogen. Rice is the most important crop in Nepal, as it is a staple food for many not only in Nepal, but also in most of Asia where 90% of the world's production of rice comes from (Bigirimana et al., 2015). Maize is the second most important crop in Nepal (Subedi, 2015). It contributes to 24.93% of the edible cereal crops in Nepal.



There are about 75 fungal diseases that are pathogenic to maize crops in Nepal (Subedi, 2015). The national average yield for maize crops in Nepal is about 2.46 mt/ha compared to Canada's 2015 national estimated average of 11.65 mt/ha (Subedi, 2015) (Kulasekera, 2016). Looking at these two pieces of data, it is apparent that Nepal lacks the fungicides that it requires in order to keep up with the growing population and food demand.

### Benefits to Nepal

There are many benefits to sending an azoxystrobin based fungicide to Nepal. The most significant benefit would be the higher yield that would result from the use of AZteroid fungicide. This higher yield would help to feed the families of subsistence farmers, as well as leave extra to sell at market or to families close by. This means extra profit for the family, which means they would have the ability to potentially buy equipment to make their farming less strenuous.

Having retailers in Nepal sell the AZteroid product would also be beneficial, as the retailer would make more profit by selling an additional product. Also, having this product from

Vive Crop Protection could lead to the sales of other products from Vive Crop Protection, which would be good for the store owner, as well as the company here in Canada and the manufacturers in the United States.

### Marketing Opportunities/Strategy

If, and when AZteroid fungicide becomes available for registered use and purchase in Nepal, the best strategy in terms of marketing would be to contact agricultural supply retailers and co-ops. Arbind Agro Centre in Kalaiya, Nepal might be a good place to start as they already sell agriculture supplies, alternative medicines, chemicals, garden products, horticulture supplies and pesticides. They also have their Pesticide Board Nepal certification so that would make it easier for them to obtain and be able to sell AZteroid fungicide in a safe manner.

### Competition

Since AZteroid does not have an exact price point available to the public yet, it is difficult to compare the product with other competitors around the world. A brand that would be a competitor with AZteroid fungicide is an azoxystrobin-based fungicide called Custodia. Custodia is a product that is sold by ADAMA India Private Limited, which is located in Hyderabad, Telengana, India. This product is 11% azoxystrobin, which is less than the azoxystrobin percentage in AZteroid, and 18.3% Tebuconazole (Custodia, 2016). It is available in multiple sizes and sells online for ₹3,335.00 INR per litre, which is about 49 USD (Custodia, 2016). This product is located in India, a country right next to Nepal, so minimal costs would be added to the product for shipment unlike AZteroid, which has to follow a long chain of transportation steps, each step increasing the price of the product for Nepalese farmers.

## Transportation Logistics

The service that IFF (International Freight Forwarders) offers would be the most realistic way to ensure that the proper steps are taken in regards to efficiently exporting AZteroid fungicide to Nepal. International Freight Forwarders would be used to negotiate fair transportation freight rates and to prepare the appropriate documentation needed to export AZteroid to Nepal (International Freight Forwarders, 2016). Since there is limited information on this product available to the public, it is difficult to determine the exact transportation logistics. With the information that is available, it can be assumed that the product would have to be shipped by truck to a shipping port on the east coast of the United States. From there, AZteroid would be shipped by sea because generally speaking, shipping by sea is cheaper than shipping via air but unfortunately, shipping by sea can take an upwards of one month to arrive overseas (Rau, 2016). With competitors being nearby in India, the cheapest shipping possible for AZteroid to Nepal would be the most ideal. The cargo ship would arrive at the Port of Kolkata, and then would need to be trucked via highway to a retailer such as Arbind Agro Centre in Kalaiya. A Letter of Credit is a standard method of payment when transacting business in Nepal, which is beneficial for making international trade (“Sourcing from Nepal: Banking, payments & export documentation”, 2016).

## Tariffs

For Nepal, tariffs are a source of domestic revenue. Therefore, there will be an applied tariff to all products shipped into Nepal. As of 2003, agricultural imports are charged a 10% tariff (“Customs and duties - Nepal - import, export, average, area, tariff, policy”, 2016).

## Application of Product

In order to safely use and apply AZteroid fungicide, personal protective equipment needs to be used. This includes: long sleeved shirt, long pants, chemical resistant gloves made from a waterproof material, shoes and socks (Vive Crop Protection, 2016).

Before use, AZteroid must be shaken well and diluted. If it is being mixed with liquid fertilizer, the proper ratio of AZteroid to liquid fertilizer must be accurately mixed. The mixture should not be left to sit overnight as it may separate. In the most ideal situation, a spray tank would be used to apply the AZteroid fungicide via foliar application. For in-furrow application, ideally, AZteroid would be applied with center pivot, lateral move, end tow, side roll, traveler, big gun, solid set, hand move or drip/trickle irrigation systems (Vive Crop Protection, 2016). Any other form of in-furrow application could harm the plants. However, spray tanks and tractors are not accessible to the people of Nepal, and out of approximately 43000 square kilometers of agricultural land in Nepal, only about 27.7% of that land is irrigated (Trading Economics, 2016). For the farmers who do not have one of the required irrigation systems, a manual backpack sprayer would be the most useful way for Nepali farmers to apply AZteroid fungicide.

## Challenges of Exporting to Nepal

Many challenges and barriers will be encountered during the process of exporting AZteroid fungicide to Nepal. Not only in the exporting steps will challenges be encountered, but problems will also arise with the general use of AZteroid fungicide by the farmers in Nepal. Nepal has a lack of education and poor infrastructure.

Lack of education in Nepal could become a huge issue in relation to the safe use of fungicides, as well as any pesticides in Nepal. In 2012, the literacy rate of adults in Nepal was only 57%. For adolescent females (ages 15-24), the literacy rate was 77.5% and for males (ages 15-24), 89.2% (UNICEF, 2016). There is a common trend of females having lower education than males, so if 57% percent of adults in Nepal are literate, it can be assumed that less than half those people are women. If farmers are unable to read the instructions, hazards, recommendations etc., it is likely that there are going to be injuries and health concerns for those people. Since the men aren't the ones doing the extensive labour, all of these complications will fall onto the young boys, girls and the wives of the farmers.

Poor infrastructure in Nepal is another obstacle that would be encountered during the transportation process of AZteroid to the farmers of Nepal. It would not be overly difficult to get the product to retailers, as they are likely in towns or cities which are connected by The Strategic Road Network (SRN) ("2.3 Nepal Road Network - Logistics Capacity Assessment - Wiki - Digital Logistics Capacity Assessments", 2016). The main highway in Nepal is the Mahendra highway, and it goes into the terai region for about 1000 kilometers, east to west. Due to Nepal's poor geology, there are only few roads that go further into the hills and mountain region but they are often slow and backed up because of the arduous terrain and poor road quality ("2.3 Nepal Road Network - Logistics Capacity Assessment - Wiki - Digital Logistics Capacity Assessments", 2016). These roads are not very beneficial to the farmers because most farmers in the hills and terai have no vehicle to use on these types of roads, and even if they did, the roads do not go right past their farm like we are lucky to have in Canada. Therefore, animals such as oxen, donkeys or buffaloes can be used as labour animals on the farm as well as a form of

transportation to move product in the terai and mountain regions ("Why livestock matters in Nepal", 2016).



<http://dlca.logcluster.org/display/public/DLCA/2.3+Nepal+Road+Network;jsessionid=48EE2495B99A068B2204CFB7E0A25B60>

**Figure: Map of primary, secondary, tertiary roads and tracks/trails in Nepal**

### Future Studies Required

In order for Nepal to get the best use out of AZteroid, it would be beneficial to have researchers from Vive Crop Protection stay in Nepal for several months before the product is exported, and during the first few months of the product use. In Nepal, they would be able to conduct further research on the needs of the Nepali farmers, chemically speaking. Perhaps there

is a way for the product to be even more useful in a country like Nepal if the chemical properties are changed so that they prevent more fungi that are present overseas. Also, it would be important for the people that are going to be using the fungicide to get some sort of training on how to use the product safely, and that could potentially create some jobs for Vive Crop Protection in Canada.

### Conclusion

In conclusion, AZteroid probably is not the best export product to send to Nepal. The product could end up doing more harm than good, as it may be difficult for farmers to use the product safely. Also, there is stiff competition in India with a very similar product, that would be able to get the product to Nepal for much cheaper than Vive Crop Protection would.

Overall, I think there is a better way for the Nepali subsistence farmers to prevent yield losses due to fungal infections, and that would be to use a more conveniently priced and located product such as Custodia that can be purchased from ADAMA India Private Limited, which is located in Hyderabad, Telengana, India.

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