

Exportation of Monensin from Canada to the Nepal

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Part 1: Product Info

Introduction

Monensin Premix of Bio Agri Mix, otherwise known as Rumensin of Elanco, is a feed additive containing monensin sodium for livestock such as dairy cows, beef cattle, chickens and turkeys which increases the overall health of the animal (Bio Agri Mix, 2016) & (Elanco, 2016). Monensin would be a beneficial feed additive for Nepali farmers as the product can help a variety of important Nepalese livestock in more than one way. This report will focus on the feed additive monensin, which is distributed in Canada by Bio Agri Mix and distributed internationally by Elanco (Rob Bell, 2016). This report will study the potential agricultural improvement in Nepal with the export of monensin from Canada to Nepal, as well as its benefits to each country. This report is meant to provide a detailed description of the product for the public in attempt to help a less fortunate country located on the other side of the world.

Description of Canadian Company

In research for the product monensin Premix, there were two larger companies that were come across which both distribute monensin as a livestock feed additive, Bio Agri Mix and Elanco. Elanco would be the company of choice to ship monensin to Nepal as Bio Agri Mix does not distribute their products internationally (Rob Bell, 2016). Elanco's headquarters are located in Greenfield, Indiana in the United States of America, but have distributors all over the world including Guelph, Ontario, Canada (Elanco, 2016). Elanco was first found as Eli Lilly and Company in the year of 1953 when they developed their first antibiotic for veterinary use (Elanco, 2016). Since their first antibiotic development in 1953 they have developed many more pet and livestock products to improve animal health and production (Elanco, 2016). Rumensin was created in the year of 1975, Rumensin was first used for the improvement in rumen fermentation to improve feed efficiency in beef cattle (S. Sachtleben, 2011). Elanco's mission statement is "We provide those who raise and care for animals with a comprehensive set of animal health products and knowledge services that empower them to address the global

challenges of a diverse and changing world (Elanco, 2016).” Monensin feed additive has the capability to greatly improve the general health of livestock in Nepal, and ultimately improve the lives of many Nepalese farmers and citizens that are not in the agriculture industry, as there will be an increased supply of food from livestock which contain high quality protein and essential amino acids.

Product description

Monensin is a feed additive for livestock, most commonly monensin is used for dairy cows, beef cattle, chickens and turkeys (Bio Agri Mix, 2016). In all of the above named livestock Monensin prevents coccidiosis, which is a sever small and large intestinal disease mainly effecting chickens and turkeys (Elanco, 2016). Coccidiosis decreases the nutrient absorption of animals which makes it harder for livestock to gain weight (Chicken Vet, 2010-2016). Sever cases of coccidiosis can also cause death in livestock (Chicken Vet, 2010-2016). Monensin prevents coccidiosis by killing the protozoa that cause the intestinal disease which commonly target younger livestock experiencing large amounts of stress (J. Mckinnon, 2015). Monensin is most commonly used for weight gain and increased protein production in dairy cows and beef cattle (Bio Agri Mix, 2016). Monensis has the ability to decrease the loss of good body conditions of lactating dairy cows (Bio Agri Mix, 2016). Lactation uses a sufficient amount of energy in dairy cows and without the proper nutrition, it can result in poor health of the animal (The Cattle site, 2015).

Monensin is considered to be an ionophore (AGScientific, 2011). Ionophores promote more sustainable rumen fermentation, by shifting the rumen microbial population (J. Mckinnon, 2015). The rumen becomes more efficient at capturing energy from feed, allowing less feed intake with the same outcome (J. Mckinnon, 2015). Ionophores also decrease lactic acid accumulation and help control the pH of the rumen (J. Mckinnon, 2015). Cattle that are fed monensin in their feed mixtures have more stable eating patterns and are less likely to experience discomfort from digestion, anything form coccidiosis, to bloating (J. Mckinnon, 2015). If cattle do not bloat as often there is also a decrease in methane gas production from cattle treated with monensin (G. T. Schelling, 1984).

Monensin must be mixed very thoroughly into the feed that it will be fed with and must have previously been stored in a cool, dry space below 25 degrees Celsius but above freezing point (Rumensin 90, 2016). The product must also not be used after its expiration date (Rumensin 90, 2016).

Table 1. Mixing Directions for Feedlot Cattle Feeds (90% dry matter basis)

Desired Medicated Feed _a grams/ton	Monensin Concentration mg/lb feed	Amount of Rumensin 90 Needed per ton	
		lbs.	grams
5	2.5	0.06	25.00
20	10	0.22	100.02
30	15	0.33	150.03
400	200	4.41	2000.40
1200	600	13.23	6001.19

<https://www.drugs.com/pro/rumensin.html>

Table 1, shows the amount of Elanco’s Rumensin 90 is required to get the desired amount of monensin to feedlot cattle.

Product risks

Monensin Sodium can be highly toxic and even cause death in cattle if it is not given in proper doses with a certain amount of feed (E.L. Potter, 1984). Mortality in cattle is most common when monensin is used for the first time but there should be little concern as long as manufacture directions are put in to practice (E.L. Potter, 1984). Dairy cows must also be taken off of monensin, so that it is not being consumed continuously because it can result in birth defects of their future calves (Monensin Premix, 2016). On the other hand, any amount of monensin can be toxic to horses causing either acute death or delayed cardiac circulatory failure

(E. Muylle et al., 1981). When monensin toxicity occurs it causes cell death by essentially inhibiting ion stability within a cell (S. Sachtleben, 2011). There is no cure available for monensin toxicity other than time, therefore it is quite serious (S. Sachtleben, 2011).

Environmental Concerns

Monensin manufacturing plants release very little pollution (Elanco Products Company, 1989). Essentially no monensin will escape from the processing plant other than very diluted wash waters that are used to clean the processing facility (Elanco Products Company, 1989). The dilute wash waters undergo treatment before they are released into the environment (Elanco Products Company, 1989). Manufacturing plants that produce monensin have procedure dust control within their dry facilities in order to prevent particulate matter from escaping the plant into the environment (Elanco Products Company, 1989).

Cattle and other livestock that are fed monensin in their feed have traces of it in their manure, which is used to fertilize cropland (Elanco Products Company, 1989). The highest expected concentration of monensin that would be found in any livestock manure would be 3.3ppm, and in the soil it would be diluted to approximately 0.066ppm (Elanco Products Company, 1989).

Monensin's use in Canada

Monensin is not very common in Canada for dairy farms because of the potential risks of birth defects although the many benefits (OVC, 2000). Monensin is quite common in the Canadian beef industry, most commonly for the prevention of coccidiosis and increase feed efficacy to increase production and profit margins (OVC, 2000).

Manufacturing details

Monensin is a product that first starts off in the fermentation process (Elanco Products Company, 1989). Later on in the process to recover the desired material, monensin sodium, the product under goes the process of evaporation (Elanco Products Company, 1989). The product is then filtered to collect the material which will then be dried in order to be processed into pellets (Elanco Products Company, 1989). From the pellet form, the pellets are crushed, screened and

blended to produce a consistent textured mix that can be added into a feed mixture for livestock (Elanco Products Company, 1989).

Fermentation		
	<p>Rumensin and Tylan are products of fermentation, beginning within a carefully controlled cell bank and grown in large, room-size fermentation tanks. Quality controls are monitored continuously. Each raw material batch is sampled, tested and approved prior to moving to the next stage of the process.</p>	<p>Assurances for our customers:</p> <ul style="list-style-type: none"> • Free from foreign DNA • Includes no extraneous materials • Delivers guaranteed potency
Recovery and granulation		
	<p>After fermentation, the material is processed and dried in a tightly controlled pellet mill to form consistent standard-size granules. Granule size and consistency determine how evenly a product mixes in feed.</p>	<p>Assurances for our customers:</p> <ul style="list-style-type: none"> • Has a high-quality, robust, granular formulation designed for even distribution in feeds <ul style="list-style-type: none"> ◦ Free flowing ◦ Particle size profile that works well in feed mixing ◦ Not dusty; low risk of carryover
Finishing		
	<p>Product moves from granulation storage silos through blending, mixing and bagging. It is bagged, palletized and shrink-wrapped for distribution.</p>	<p>Assurances for our customers:</p> <ul style="list-style-type: none"> • Consistent packaging protects potency • Traceability is guaranteed with every bag

Figure 1: Monensin Production

<http://www.elanco.us/products-services/beef/rumensin-f/quality-manufactured-cattle-feed-additives.aspx>

Benefits of Trade to Canada

The exportation of monensin to Nepal from Canada would be beneficial since it contributes to the Canadian economy. Exports are encouraged as they create jobs for the exporting country, such as manufacturing the product, transportation of the product as well as

mechanics that fix the machinery to produce the product, or even those that perform maintenance on the trucks that are used to transport the product (K. Amadeo, 2016). Exports ultimately better an economy and the quality of life for those living in it since the importing country in one way or another has to pay for the exporting countries expenses when they purchase the product (K. Amadeo, 2016).

Part 2: Export Potential to Nepal

Description of Nepal

Nepal a multiethnic, multilingual and multi-religious country located in the continent of Asia between the countries of China, on the north and India, on the south (Government of Nepal, 2015). The most northern region of Nepal is where the Himalayan mountains are located, including Mount Everest (Rose, 2013). The population of Nepal is 30,986,975, Nepal's capital city is Kathmandu, and the overall growth rate of the country's population is 1.82% (Nepal Demographics Profile, 2014). 86% of all Nepalese citizens practice Hinduism (Government of Nepal, 2015). At birth the expected life of a Nepalese is about 68.4 years, and the gross domestic product is approximately nineteen billion (Nepal, 2013). Nepal is a landlocked country and therefore is isolated, for this reason Nepal remains very poor and undeveloped, it is considered to be one of the least developed nations in the world (Rose, 2013).

The currency of Nepal is the Nepalese Rupee, \$1.00 Canadian is equal to 80.98 Nepalese Rupees (World's Currency Authority, n.d.). Recently many countries have offered Nepal economic assistance, including Germany, Japan, the United Kingdom, Denmark, the United States of America, India, China and Canada, in no particular order (Rose, 2013). The majority of Nepal's terrain is made up of mountains, 75% to be more precise (Rose, 2013). The remaining 25% is considered to be a region called the Terai (Rose, 2013). The terai region is a low, flat region with relatively fertile land that is located on the southern side of Nepal along the Indian border (Rose, 2013).

The greatest density of ruminants is located in the hills region (Rose, 2013). Nepal is located in the sub tropics in high elevation which affects the countries climate (Rose, 2013). In the capital city of Kathmandu, the average yearly temperatures range from 10 degrees Celsius in the winter to 26 degrees Celsius in the summer, on average Nepal also has an annual rainfall of about 55 inches (Rose, 2013).

Another reason for Nepal to be the least developed country in the world is due to the few resources it has for economic development and poor infrastructure for transportation to distribute goods (Rose, 2013). Nepal relies on imported goods, mainly basic materials and agricultural products and simple equipment (Rose, 2013). Some of the major imports to the country of Nepal include fuel, construction materials, metals, fertilizers as well as many more consumer goods, on the other hand the exports of Nepal include rice, jute, timber and other textiles (Rose, 2013). Over half the population in Nepal is involved in the agriculture industry and it makes up for over half of Nepal's export earnings (Rose, 2013).

Nepal's livestock agriculture mainly includes buffalo, cattle, sheep, chickens and goats (Rose, 2013). Livestock contributes to 32% of agricultural GDP, Gross Domestic Product in 2011 (Joshi, 1992). Livestock are essential for food production like milk, meat, eggs and wool as well as agricultural labour such as cultivation, fertilization, and transportation (Joshi, 1992). Over 2 million families in Nepal own cattle (Joshi, 1992). With such a high reliability of livestock and high population of cattle per family, monensis Premix would be a good product to increase livestock health in Nepal.

Livestock Industry in Nepal

In Nepal's mountainous regions there are many sheep, goats, mules and yaks as they survive best in such regions (Khatiwada, n.d.). Further down in the hills region there are more types of livestock like cattle and chicken, those that are most commonly treated with monensin, as well as horticulture production, which provides Nepalese farmers with their main source of income (Khatiwada, n.d.) In the terai region, the flattest, most southern region, is where most of Nepal's food production takes place to feed that region as well as the other two since they are not able to produce as many crops with their poor growing conditions (Khatiwada, n.d.). Monensin would prosper in the hills region of Nepal as Cattle and poultry are mainly found in this part of Nepal, Refer to table 2.

Region	Livestock owners	Herd size (TLU)		Own LR	Own SR	Own Poultry	Own Pigs
	%*	Mean**	sd	%***	%***	%***	%***
Mountains	95.1	3.3	2.7	94.6	52.4	47.0	11.3
Rural hills	93.9	2.9	2.3	94.7	58.5	60.0	13.2
Rural terai	86.2	2.3	2.5	84.7	55.1	44.7	12.2
Other urban	37.1	0.6	1.1	69.8	44.0	44.7	2.5
Katmandu	13.7	0.1	0.6	54.3	23.9	50.0	2.2
Total	76.3	2.2	2.4	88.7	54.8	51.2	11.7

* Percentages refer to whole subsample

** Means refer to livestock owners only

*** Percentages refer to the regional livestock owners subsample

Note: LR=Large Ruminants, including cows, buffaloes and yaks.

SR=Small Ruminants, including sheep and goats.

Source: NLSS (World Bank, 1996), calculations by the author.

Table 2: Livestock in the regions of Nepal

<http://www.fao.org/ag/againfo/programmes/en/pplpi/docarc/wp13.pdf>

Total Livestock (Home Production and Farm Cash)			
Region	Mean Income (NRs.)	Share of Total Income (%)	
Mountains		10.6	
Rural Hills		12.9	
Rural Terai		8.4	
Other Urban		3.3	
Katmandu		1.0	
Total		8.8	
Livestock Home Production			
Region	Mean Income (NRs.)	Share of Home Production Income (%)	Share of Total Income (%)
Mountains	1,899	11.1	7.1
Rural Hills	2,403	14.0	7.5
Rural Terai	1,183	9.2	3.9
Other Urban	1,052	12.5	2.1
Katmandu	271	7.4	0.5
Total	1,562	11.5	4.9
Livestock Cash			
Region	Mean Income (NRs.)	Share of Farm Cash Income (%)	Share of Total Income (%)
Mountains	1,094	44.4	3.5
Rural Hills	1,751	47.6	5.4
Rural Terai	1,236	32.2	4.6
Other Urban	503	31.9	1.2
Katmandu	1,176	29.5	0.6
Total	1,288	39.9	3.9

Table 3: Nepal Livestock production

<http://www.fao.org/ag/againfo/programmes/en/pplpi/docarc/wp13.pdf>

Table 3, refers to the livestock production for home production and livestock cash production, both also prove that most livestock production takes place in the rural hills of Nepal.

Nepal is a very poor country and struggles to provide an adequate amount of feed to their livestock. Monensin promotes higher nutrients absorption, therefore livestock become

more efficient at acquiring important nutrients and energy from their feed (Bio Agri Mix, 2016). Livestock play an important role in the lives of Nepalese farmers as a large portion of their

income is retrieved from such practices as well as an important food source of protein from the animal products that come from their livestock such as meat, eggs and milk (Livestock Farming, 2012). In Nepal, as mentioned in the introduction, over two million families own at least one of their own head of cattle which are most commonly used for milk due to the practice of Hinduism (Livestock Farming, 2012). Chicken are also a very common livestock in Nepal, almost as common as cattle. Approximately one and a half million families in Nepal own their own chickens, cattle are to be considered the most commonly farmed livestock in Nepal (Livestock Farming, 2012). For this reason, monensin would be a worthy agricultural product to import into Nepal since it has the ability to improve the production of their most commonly relied on livestock.

Needs and Benefits of Importing Nation (Nepal)

There are many potential benefits of importing monensin to Nepal. Mal-nutrition is an extremely prominent issue in Nepal affecting a large number of children as well as their parents and extended family, as a result mortality rates are higher than expected (IRIN, 2015). Over 60% of child mortality is the cause of mal-nutrition (Nepal Demographics Profile, 2014) The largest contributors to mal-nutrition in Nepal include non-adequate childhood care practices/education, and poor agricultural investment of the country (IRIN, 2015). Roughly one quarter of Nepalese citizens live under the countries *poverty line*, therefore at least half of the country is suffering (IRIN, 2015).

Citizens of Nepal also experience the intestinal infection of coccidiosis which can be treated with monensin (PubMed.org, 1993). With the consumption of animal products that are also fed monensin, there is a possibility that it could help their own digestive system as well. Incorporating monensin into the feed of livestock living in Nepal would increase the production of meat, eggs and milk in the Cattle and poultry industries, providing a greater food supply with the same amount of feed (Bio Agri Mix, 2016). The previously listed animal products are also very high in protein, essential amino acids and vitamins, which would help a portion of the citizens struggling with mal-nutrition in Nepal. Monensin not only Improves the productivity of livestock but also promotes animal health which ultimately means fewer deaths in livestock (Elanco, 2016). Fertility rates of livestock will also increase, allowing Nepalese farmers to more easily increase their herd size, increasing their overall income (Elanco, 2016). Table 4, below

proves that the dependency of livestock in Nepal is very important and that even a small increase in production can greatly benefit poor farmers in Nepal.

Rural Terai Typology															
	Total Income					Home Production		Farm Cash		Total Livestock	Livestock Home Production		Livestock Cash		
	Farm	Wage	Rent	Enterprise	Other	HP/TF	HP/TOT	FC/TF	FC/TOT	L/TOT	LHP/HP	LHP/TOT	LC/FC	LC/TOT	
Landless, no livestock	15.7	24.2	12.7	34.4	13.1	94.3	15.2	5.7	0.5	0.0	4.2	0.2	66.7 ¹²	0.2	
Landless, with livestock	39.1	22.9	10.4	14.4	13.2	78.5	29.6	21.5	9.4	11.4	16.8	4.8	65.6	6.6	
Marginal land, less than 2 TLU	56.1	17.4	7.6	12.4	6.4	82.3	44.3	17.7	11.8	6.4	6.2	2.3	31.5	4.1	
Marginal land, more than 2 TLU	73.2	6.7	6.2	6.2	7.6	81.2	58.1	18.8	15.1	13.0	12.8	6.6	40.6	6.4	
Non-marginal land	80.2	5.8	6.4	4.6	3.0	71.1	55.1	28.9	25.1	8.0	7.4	4.0	20.4	4.0	
Total	60.8	13.2	7.8	11.0	7.2	78.6	45.7	21.4	15.1	8.4	9.2	3.9	32.2	4.6	

Abbreviations:

HP: Farm home production income
TOT: Total household income

FC: Total farm cash income
LC: Livestock cash income

TF: Total farm income
L: Livestock

LHP: Livestock home production income

Table: 4

<http://www.fao.org/ag/againfo/programmes/en/pplpi/docarc/wp13.pdf>

Transportation Information

Rumensin from Elanco is distributed in 25kg bags, 1 bag of Rumensin would cost just over \$1,200 USD to ship to the capital city of Nepal (Fed Ex, 2016). The cost of shipping for 20 bags of Rumensin to Nepal would cost just under \$20,000 USD (Fed Ex, 2016). Not including the cost from Guelph, Ont. to Toronto, or from the Katmandu airport to Farmers or veterinarians in Nepal. This would be an expensive product to ship over to Nepal from Canada as it is heavy and has too high of a cost for such a poor country like Nepal.

Product Competition

Elanco is a worldwide company and is also located in India and China, which are the two countries that completely surround Nepal. This would create a lot of competition as their shipment costs would be much cheaper than of one from Canada. Elanco was unable to be contacted, therefore the cost of their product is uncertain but they own the distributors in Canada, China and India so they would all have similar costs, it just depends on shipping costs.

Part 3: Conclusion

Conclusion

Overall monensin is a very suitable product that could improve the agriculture industry in Nepal but since there are exporters in both India and China. It does not make sense for Canadians to export monensin to Nepal as the shipping expense would be very expensive and considering the fact that Nepal is an extremely poor country they would likely not be able to afford paying for the product, including the shipment price from Canada. It would be much more economical for Nepalese farmers to buy monensin from either India or China that they do not spend as much money for the identical product.

Monensin also requires very specific instructions in order to be successfully used so that toxicity is not a problem, therefore education is required for the farmers that will be purchasing it. Elanco might have to place an employee or a few employees in Nepal so that Nepalese farmers that are considering using monensin as a feed additive are able to learn from someone who is familiar with the product.

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