Introducing Sorghum-Sedan Grass Hybrid in Nepal

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Part I- Product Information

Sorghum- Sudan grass hybrid is a warm season grass, unlike most cool season grass forages and is created by crossbreeding sorghum grass with sedan grass to create Sorghum- Sudan grass hybrid (Wright, Wheeler, & McKinlay, 1998). This hybrid is known to be drought- tolerant and it produces forage dry matter when an emergency occurs, for example a drought (Wright et al., 1998). This is possible because sorghum-Sudan grass hybrid has twice the amount of secondary roots compared to corn, which maximizes water intake through the roots, and much less leaf area which minimizes water evaporation resulting in moisture loss (Wright et al., 1998). However, conventional Forage Sorghum differs from conventional Sudan grass quite largely. Conventional Forage Sorghum has sweet juicy stems and produces less plant than Sudan grass, and has very slow regrowth, with only one cut per year offered (Wright et al., 1998). Conventional Sudan grass on the other hand has a slimmer stem, with many leaves and quick regrowth, and offers multiple cuts per season (Wright et. al., 1998). The Sorghum-Sudan hybrid grass is a combination of both of these grasses, with a larger stem and more leaf-like, while offering multiple cuts (Wright et al., 1998). This hybrid is most popular in Ontario (Wright et al., 1998). This is a fiber- digestible hybrid (Howard, 2005). The digestible neutral detergent fiber for this grass is around 70% compared to corn and hay, which are 53% and 52% respectively (Howard, 2005). When growing this grass, the seeds are planted into warmer soils since it is a warm season crop (Wright et al, 1998). Nitrogen fertilizer is also necessary since it in the same family as corn (Wright et al, 1998). This will unfortunately add to costs. Its planting strategy can be compared to those of the crop of barley for example. It is planted in the spring, most commonly with a

seed drill with a grass box on the back (M. Pecoski, personal communication, October 7, 2014). It can be harvested in several different ways throughout the summer, depending on the farmer's harvesting plans and strategies (M. Pecoski, person communication, October 7, 2014). After being planted, very minimal work is required to help the grass maximize in growth (Howard, 2005).

Sorghum-sedan grass hybrid benefits Canadian farmers because of how efficient it can grow, and its tolerance to dry, hot weather as well as its ample yields and low growing costs (Wright et al., 1998). Because the seeds are planted into warm soil, the use of herbicide is greatly reduced (Howard, 2005). The use of insecticides is also reduced because rootworms have already hatched by the time the seed is planted and insect nests do not take over the seed when it is trying to germinate (Howard, 2005). Another big advantage is that Sorghum- Sudan hybrid grass does not need to be sprayed. Since the hybrid grows so fast and efficiently, the crop will overpower surrounding plants that are potential competitors of nutrients and moisture. Weeds will not be able to compete with the fast maturing plant, add will die out (Howard, 2005). This means that the crop will not need to be sprayed, and this will cut major costs, as chemical sprays can be expensive. Farmers can get anywhere from 1-4 cuts of the hybrid grass per year, and yields 2-3 ton/ acre on average, and yields can be even higher in warmer weather (Wright et al., 1998). Farmers can take more than one cut of the grass per year, so less acres are required to get the same amount of feed as if the farmer was to plant corn silage which only produces one cut a year making land use more efficient. Sorghum-sedan grass is as good or even better than corn silage as an energy source, as long as it is harvested at optimal maturity (Wright et al., 1998). It is also capable of being a better protein source

for livestock than hay, or alfalfa (Wright et al., 1998). Sorghum- Sudan Hybrid can replace hay or corn silage in a livestock feed ration (Howard, 2005). When the hybrid grass is replacing either one of hay or corn in a ration, there are a few other concerns. If the hybrid is replacing hay, or alfalfa, grain volume can be reduced, and protein supplements do not necessarily need to be increased (Howard, 2005). This will lead to less money spent on protein and more money in the farmer's pocket. When the hybrid grass is replacing corn silage, the energy level is just as good, but starch levels may need to be added (Howard, 2005).

When planting, the seeds must be planted into warm soil; so later season planting may be required (Wright et al., 1998). The most common way to plant the hybrid in Canada is by using a wheel-driven seed-drill with a grass box (M. Pecoski, Personal Communications, October 7, 2014). Many manufactures make these drills; a few include John-Deere, Case IH, and New Holland. The cost of these drills brand new depends on the make, model and size, but an average- sized 15 foot used drill can be purchased from $1500-$3000 (K. Svendson, Personal Communication, November 13, 2014). The seeds should be planted 1-1.5 inches deep in row widths of 7-14 inches wide, at a population 13.5lbs/acre, at an optimal soil pH level of 5.5- 7.5 (Wright et al., 1998). It is recommended that Sorghum-Sudan hybrid is planted in the spring, and the last harvest should be taken before the first frost (Wright et al., 1998). The first cut of the season can be taken approximately 60 days after planting, and the plant should exceed 65cm in height at 70-75% moisture (Wright et al., 1998). Compared to corn and hay, this hybrid is way more efficient at growing. Hay is usually seeded down with barley, which usually takes a whole season to grow and be harvested, and corn also takes an entire growing

season to fully mature. This hybrid does not need to be seeded down with anything; it is planted directly, and matures way sooner than corn being only approximately 60 days (Wright et al., 1998).

There are many several ways that this hybrid grass can be harvested as well. When harvested, the hybrid grass can be chopped for green feed, baled into high moisture bales, cut and dried and then baled for dry feed, or left for livestock to graze on in a strip grazing system (Wright et al., 1998).

The cost of a 50lbs bag of hybrid seed at Kawartha Lakes Agri Services, in Lindsay ON is $62.37 (M. Pecoski, Personal communication by phone, October 7, 2014). The seed product will come from Mapleseed out of the Lindsay, ON warehouse. This means that approximately 1.42 acres can be planted with a 50lbs bag if the 13.5lbs/ac rule is followed, and the cost per acre for seed is $43.65 compared to corn which can cost up to $90/ac depending on variety (M. Pecoski, Personal communication by phone, October 7, 2014). Sorghum-Sudan grass falls into the same family as corn, which means it requires Nitrogen fertilizer (Wright et al.). For nitrogen fertilizer, it only costs $27.50/acre compared to corn, which is approximately $100/acre (Laveque, L 2014 Personal communication by phone, October 7, 2014). This is because corn requires more nitrogen than Sorghum- Sudan grass per acre (Wright et al., 1998). However, Sorghum – Sudan hybrid grass does not only require nitrogen at planting, but as well as nitrogen fertilizer after each cut (Wright et al., 1998). It is suggested that 90-100 pounds of nitrogen per acre is applied at the time of planting, and then an additional 45 pounds per acre after each cut is taken (Wright et al., 1998). This is a lot of nitrogen fertilizer if the farmer plans on taking 3 or 4 cuts per season, and that is going to cost a lot of money (M.

Pecoski, Personal Communication by phone, October 7, 2014). There is not a large market for sorghum-sedan grass hybrid, except for those growing it to feed their livestock (L. Laveque, Personal communication by phone, October 7, 2014). In Canada, the most common farmer that grows this forage is a dairy farmer, for use of feeding it in their total mixed ration (L. Laveque, Personal Communication by phone, October 7, 2014). This hybrid is optimal for lactating dairy cows, dry cows, and replacement heifers older than 12 months of age (Wright et al.). However, there is a health hazard with this grass. This grass hybrid is not frost tolerant (Wright et al., 1998). If frost hits the plant, and then the plant is harvested and fed to an animal within a period and is digested, the forage is capable of releasing prussic acid into the bloodstream of the animal, and the animal can die from respiratory paralysis (Wright et al.). A test was done, and results shown that feeding Sorghum-Sedan grass hybrid in a dairy total- mixed ration (TMR), can increase milk production by up to 1 liter per cow an day (Wright et al., 1998).

Part II- Export Potential to Nepal

To get this product to the capital of Nepal, Katmandu, from Mapleseed, major transportation is required since it is approximately 12,000 km away. Jamie Marquis Trucking out of Little Britain, ON can truck the bags of seed from the supplier in Lindsay, ON to the Hamilton Shipping Port in Hamilton, ON. Jamie Marquis' trucks legally hold 40 ton and his cost is $17 per ton to ship the product from Mapleseed to the port in Hamilton (J. Marquis, J, Personal Communication by phone, October 7, 2014). To be most efficient, 40 tons of sorghum-sedan grass will be shipped every trip that one of the trucks make from Mapleseed to Hamilton. This means it will cost $680 for trucking

from Mapleseed to Hamilton, per trip. If one bag of seed weighs 50lbs, this means that the shipping truck will hold 1760 bags of seed and on average it costs 38.5 cents to truck 1 bag. From the Hamilton Port, the bags of seed will be transferred onto a ship called a Shuttle vessel, and will be shipped out from the Hamilton Port. A smaller ship called a shuttle vessel will transport the product from the Hamilton Port, out into Lake Ontario, and over to Quebec (M. Weaver, Personal Communication by phone, October 8, 2014). Once this ship arrives in Quebec, many shuttle vessels are "trans- loaded" onto a huge ocean vessel, called the Panamax (M. Weaver, 2014). The Panamax is the largest ship that is capable to travel through the Panama Canal (M. Weaver, 2014). The loaded Panamax then travels out the St. Lawrence River, down around the east coast of Canada and the United States, through the Caribbean Sea, and through the Panama Canal to the Pacific Ocean, and straight across the Pacific Ocean to the Port of Shanghai in China (M. Weaver, 2014). It is cheaper to truck the product to Hamilton, ON and then ship it from there compared to transporting the product via rail to Victoria, BC and then shipping it on an ocean vessel from there (M. Weaver, 2014). The reasoning for this is because rail is government capped, meaning that the company has to make a certain amount of money, and it makes the price of shipping products via rail extremely high (M. Weaver, 2014). The Panamax holds 60,000 ton, and the cost per ton for shipping is $50 dollars, but the cost is always changing with 10 dollars of to average of 50 dollars (C. Galovic, Personal communication by phone, October 7, 2014). From the Shanghai Port, the seed will be transported onto a truck off of the Panamax and trucked 3500km at the cost of $17 per ton plus fuel using Jamie Marquis' trucking company to Pioneer Agriculture Farm LTD., in Kathmandu, Nepal. From there, farmers can buy the seed. It is difficult to get an exact

amount for the cost of the seed once the product arrives at Pioneer Agriculture LTD., in Katmandu because the shipping is fairly expensive. An approximation of the cost per bag at Pioneer Agriculture LTD. is roughly $75 Canadian dollars, which is about $6750 Nepalese rupees sine 1 Canadian dollar is equivalent to 90 Nepalese dollars, or rupees (R. Khanal, Personal Communication, October 3, 2014). This is expensive for the average Nepalese farmer; because average income in Nepal is tremendously lower than here in Canada (R. Khanal, October 3, 2014).

This product will very much benefit Nepal and it's agriculture sector. As mentioned before, this hybrid seed produces a drought tolerant forage plant (Wright et al.). Nepal is known for its warmer, dry climate, and this is why sorghum sedan grass will do so well here. The hybrid grass yields even better with hotter temperatures, and Nepal's summer temperature can exceed over 37^{o}C and can be very dry for a longer period of time (R. Khanal, 2014)

Here's a brief view of the average temperatures and rainfall during peak summer and winter in three most popular tourist areas:

Place	Summer (May, June, July)			Winter (Dec, Jan, Feb)		
	Max (°C)	Min (°C)	Rain (mm)	Max (°C)	Min (°C)	Rain (mm)
Kathmandu	28.1	19.5	312	19.3	3.0	15.4
Pokhara	29.7	21.3	829.7	20.3	7.7	26.3
Chitwan	33.0	25.3	404.0	24.1	8.3	13.8

For more information about Nepal's climatic conditions, please visit: http://www.dhm.gov.np (official web site of the Department of Hydrology & Meteorology, Ministry of Environment).
http://welcomenepal.com/promotional/know-nepal/climate/

Sorghum-sedan grass hybrid can handle both of these two problems, and will survive the drought and will maximize yield because of the extra heat and farmers will not run out of forage as this grass has 1-4 cuts offered (Wright et al., 1998). In the

summer months in Nepal, there is quite often a dry drought for a relatively long period of time, and this is generally when farmers in Nepal run out of forage and feed to feed their cattle and other livestock (R. Khanal, 2014). Sudan Grass originally came from Africa, where moisture is not to spare, and since the grass can survive droughts because it is drought- tolerant, the grass hybrid can grow and continue to grow with minimal precipitation (SARE, 2104). This means that it is possible for Nepal to have forage to feed their animals and livestock all year round because the plant continues to grow with minimal moisture, and several cuts are still offered per season (SARE, 2014). Livestock and are an extremely important asset to the farmers of Nepal (R. Khanal, 2014). Animals produce food, labor, and culture in Nepal and making sure that a farmer has enough feed to feed their livestock and keep them healthy is important to keep the farm in order, and make sure the farming family can enjoy life without the worries of losing livestock to death to something that can be prevented like lack in feed. The most efficient way planting is the use of a wheel-driven seed-drill with a grass box pulled by a tractor, but this likely will not make sense for Nepal farmers economically as machinery add to costs, and fuel will be required also witch will add to the cost further more. For the Nepalese farmers to be most economical, the use of livestock should be used to pull the seed-drill. If the availability of a seed- drill is not present, farmers can broadcast the seed by hand or a little hand help spreader of some sort. The seed should then be incorporated into the soil, and this can be done with a piece of equipment similar to a set of harrows pulled by livestock, or by hand with a shovel. Harrows would be the most efficient way especially if several acres were planted compared to a garden.

As mentioned before, newer technology equipped equipment is not readily available in Nepal, so the most inexpensive way of harvest is the strip-grazing system, as it requires no equipment. As mentioned before, there are several ways that this forage can be harvested, including chopped feed, baled dry, or high moisture bales, but the strip-grazing system is likely the most economical method for the farmers in Nepal. The strip-grazing system is a way of pasturing livestock, and the animals are just given enough feed for one half to a full day (OMAFRA, 2005). Fences are moved a few times daily to ensure fresh feed is available for the livestock throughout the entire day (OMAFRA, 2005). This method provides the highest quality of feed, produces the least amount of waste, and the least amount of damage is done to the pasture through compaction from the animals tramping the soil (OMAFRA, 2005).

This Sorghum-Sudan hybrid grass also has some environmental benefits. The fine root system and the leaves of the fast growing plant help prevent soil erosion by 50% compared to corn (Howard, 2005). Sorghum- Sudan Hybrid will not grow well in saturated soils or land that is cold and wet for a long period of time (Howard, 2005). This is perfect because Nepal tends to be dry, and is more likely to be dry for a long period of time, rather than wet for a long period of time (R. Khanal, 2014). Sorghum-Sudan hybrid will grow better in the Terai region in Nepal, compared to the Hill region, Mountain region, or the Trans-Himalayan region because the Sorghum-Sudan Hybrid grows better in more heavy clay soil than corn (Howard, 2005).

Another interesting use for the Sorghum-sedan grass is Organic insulation (M. Whittamore, Personal communication by phone, October 6, 2014). It is possible to cut the grass, let it dry, and chop it and use if for organic insulation (M. Whittamore, 2014).

This could be useful in helping keep houses warmer in the winter, and cooler in the summer. It could also be used to help preserve produce, if adding extra insulation would help keep a building full of produce keep at a lower temperature (M. Whittamore, 2014).

A strategy that would work for marketing is to compare sorghum-sedan grass hybrid to corn as stated above. Although, there is a major draw back of the Sorghum-Sudan grass, and this is that it requires a lot of Nitrogen fertilizer if no manure is being applied to the soil that the grass is being planted on (Howard, 2005). If cattle are being pastured in Nepal, they are defecating on the land as they eat, so that helps reduce the amount of nitrogen that needs to be applied to the soil, and this will reduce costs. Sorghum-sedan hybrid was shown to be just as good, or better than corn in energy levels, cheaper to grow, and yielded higher. With the arguments provided, there is no reason why farmers in Nepal would continue growing corn to feed as forage to their livestock as instead of growing Sorghum-sedan grass hybrid. To conclude, this product is strongly recommended in exporting to the country of Nepal. The price range for the bags of seed is reasonable, considering all of the positive improvements that a farmer will receive from planting this hybrid. This hybrid produces high, ample yields of quality grass forage for livestock. Sorghum-Sudan Hybrid grass is a very efficient, low maintenance crop as it grows very rapidly and produces several cuts per season, and the use of herbicides and insecticides is unnecessary. Planting and harvesting can be done efficiently with very low technology equipment, and the grass has the potential of improving the soil in Nepal regions. This grass improves the welfare of animals, and can increase animal activity. It also has the ability to produce insulation, and help prevent food spoilage, improves shelf life, and can keep houses warmer in the winter and cooler

in the summer. Thus, Sorghum-Sudan Hybrid grass will only benefit Nepal. It is an affordable, fast growing, mass-producing forage, and will improve not only the quality of life for the livestock, but also the people, and the farming families of the Nepalese farming sector.

Reference List

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Sorghum-Sudan Grass [Internet] SARE, 2014. Cited November 21, 2014. Retrieved from: http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version/Nonlegume-Cover-Crops/Sorghum-Sudangrass

OMAFRA [Internet]. Sorghum-Sudan Grass Hybrids, 2005. Cited November 21, 2014. Retrieved from: http://www.omafra.gov.on.ca

Appendix

Whittamore, M. (2014) personal communication by phone (1416-436-5925), October 6, 2014. M. Whittamore is the CEO of Whittamore farms Ltd and grows sedan grass for organic insulation and bio diesel digesters

Svendson, K. (2014) personal communication by phone (705-799-2427), November 13, 2014. K. Svendson is the CEO of Green Tractors of Omemee, ON

Marquis, J. (2014) personal communication by phone (1-705-328-8179), October 7, 2014, J. Marquis is the owner of Jamie Marquis Trucking

Khanal, R. (2014) personal communication by lecture, October 3, 2014 R. Khanal is from a farming background in Nepal and talked to our class

Galovic, C. (2014) personal communication by phone (1-905-825-7973), October 7, 2014 C. Galovic is a commodity buyer for Bunge

Weaver, M. (2014) personal communication by phone (1800-265-8345), October 7, 2014, M. Weaver is a commodity buyer for JRI Richardson Commodities

Pecoski, M. (2014) Personal communication by phone(1-705-324-7761) October 7, 2014 M. Pecoski is the owner of Kawartha Lakes Agri Services Ltd.).

Laveque, L (2014) Personal communication by phone (1-705-878-9240), October 7, 2014, L. Laveque is a seeds representative for Mapleseed Canada