

Yakmac!

An export opportunity for Nepalese farmers

Sara Wyngaarden
November 18, 2014
AGR 2150

Yakmac is a specialty version of macaroni and cheese, made with Nepalese-produced macaroni and yak milk from the Himalayas. Though not currently in production, Yakmac has potential as an export product from Nepal to Canada, benefitting Nepalese highland farmers.

Industry status and potential

Macaroni

In 2011, with 6,816 tonnes earning \$1,477/tonne, macaroni was Nepal's fifth most profitable export¹. The Nepalese macaroni industry is well-developed and thus, this article will focus on Yakmac cheese.

Dairy

Yak products are currently neglected by the Nepalese dairy industry: only seven of 250 Nepalese dairies process yak milk². Due to the remoteness of yak habitat, production is neither organized nor incentivized³. Yaks thrive in the alpine region of the Himalayas⁴. They are key to the survival of indigenous groups, providing milk, meat, wool, hide, draught labour, and fertilizer. Herdsmen migrate between 3000-4000 m in the winter and 4000-5000 m in the summer⁵. Milk processing facilities are located at lower altitudes and require delivery⁶. Thus, they are inaccessible to many highland farmers.

Industry opportunities

Indigenous groups in Nepal have processed yak milk at the farm-level for millennia⁷. Chhurpi, a popular cheese-like product, is made by boiling yak milk in an aluminum kettle over a wood-fueled fire to precipitate casein, the primary protein⁸. It is dried and hardened, extending shelf life up to months⁹. Casein is used in processed foods. Already partially dehydrated and concentrated, this product could easily be converted into Yakmac cheese powder.

An informal Chhurpi market exists between farmers and travelling traders¹⁰. Formalizing and incentivizing this market would benefit farmers, traders, and the Yakmac industry alike. Chhurpi, a value-added product, boosts farmer income. Yield is approximately 4.5%, meaning that 100 L raw milk produces approximately 4.5 kg Chhurpi. In 2013, Nepalese market prices for Chhurpi were \$12-\$17 USD/kg (x4.5 kg = \$54-\$76.5) whereas raw milk prices were \$0.25-\$0.32 USD/L (x100 L = \$25-\$32)¹¹. Partial preservation enables accumulation, making daily collection less crucial and thus empowering smallholder farmers, with low daily production, to participate in the industry. Finally, as a solid, Chhurpi is easily transported and is less susceptible than raw milk to in-transit contamination¹².

Breeding

Relatively low fertility and productivity limit the yak industry¹³. Training farmers in breeding techniques would improve fertility rates and trait selection. Higher milk yield, better niche-response, animal hardiness, and a widened geographical range would boost productivity and increase the accessibility of the Yakmac industry. For example, Chauri, a cow-yak cross-breed, demonstrates heterosis. It thrives in a wider geographical range, matures twelve months earlier than yaks, calves more frequently, and lactates longer, producing approximately four times more milk than purebred yaks or cows^{14,15}.

Required inputs

Sustainable commercialization of Chhurpi production necessitates updated technologies, farmers training regarding hygienic standards (more under “Export Potential”), feed and fuel resource management (more under “Environmental analysis”), and veterinary services. Lack of veterinarians is a major problem in the highlands¹⁶. Basic training for farmers, plus availability of professional services, would facilitate the Yakmac industry.

Sustainability analysis

Economics

Yaks are a symbol of affluence and provide a form of insurance for farmers living at the limits of arable cropland¹⁷. Yak product sales are often the sole source of cash in highland communities¹⁸. Yakmac would improve economy stability by establishing steady demand.

For poor farmers looking to enter the industry, initial herd acquisition may be unfeasible. Furthermore, a household labour shortage may make herd maintenance unmanageable, particularly if balancing Chhurpi processing with crop production¹⁹. Such problems could be mitigated through an agricultural cooperative. By pooling resources, communities can maximize productivity, ensure subsistence, and minimize risks for individual farmers.

The most significant economic aspect of Yakmac is that it is a processed product, rather than a commodity. Value-addition for agricultural products is incredibly important for economic sustainability²⁰.

Environment

There are many ecological benefits to livestock ownership²¹. In the past, however, incentivized dairy production has led to overgrazing and deforestation in Nepal^{22,23}. For sustainable Yakmac production, these issues must be addressed proactively.

A system of intensive rotational grazing maximizes fodder use while minimizing land degradation²⁴. Rotating cropland and pastureland would improve the quality shallow, infertile soils in the highlands²⁵. Forage growth and manure deposition improve soil stability, break pest and disease cycles, increase organic matter, and boost fertility^{26,27}. Furthermore, the natural distribution of manure fertilizer reduces labour requirements.

To mitigate deforestation, cooperatives and production facilities could explore alternative renewable energy, particular hydro-electricity. Nepal has vast untapped hydro-electric potential²⁸.

The commercialization of production, however, can raise biodiversity concerns. A demand for uniformity can reduce genetic diversity associated with landraces. This would restrict, rather than expand, the geographical niches of yaks and would increase capacity for disease²⁹. Overall, reduced genetic diversity would decrease system resilience and escalate industry risks. With the centralization of final processing and Yakmac packaging, however, individual variation in Chhurpi may be insignificant. The process of converting Chhurpi into powder form would enable mixing.

Socio-cultural aspects

The yak industry, like many livestock industries, is dominated by men. Women typically tend crops and care for children³⁰. In order to expand opportunities for women in the livestock industry, targeted support is crucial³¹. This could include training, financial and resource capital, as well as organizational support for cooperatives.

Nepal largely encompasses Hindu values, including reverence for cows. Since they cannot be killed, cows and cow-yak hybrids that are no longer productive become a liability³². Yaks, however, are a separate species, thus providing an alternative that circumvents this constraint. Furthermore, yaks have become central to rituals, ceremonies, and legends among highland farmers^{33,34}. The commercialization of Yakmac would draw international attention to this indigenous animal and the traditional lifestyle that accompanies it. As a result, this product would encourage highland farmers to take pride in their culture and livelihood.

Potential support

Nepal: Department of Cooperatives³⁵ → offering registration, recommendations, and promotion of domestic cooperatives

Nepal: Department of Food Technology and Quality Control³⁶ → supporting entrepreneurship in food-related initiatives

Nepal: Department of Livestock Services³⁷ → striving to reduce poverty through sustainable livestock initiatives

World Bank: Project for Agriculture Commercialization and Trade³⁸ → providing financial support to for agricultural initiatives, focussed on commercialization, trade, and sustainability. Available until June 30, 2018

Export potential

Macaroni and cheese is a Canadian icon. In 1997, Kraft Dinner (KD) was the most popular grocery purchase³⁹. Alternative brands also enjoy consumer popularity⁴⁰. Through clever marketing, Yakmac, too, can become popular amongst Canadian consumers.

Marketing

Marketers should encourage a perception of yaks as “exotic”, not alien. Promoting the nutritional value of yak milk would target health-conscious consumers. A study comparing yak cheese with grain-fed cow cheese found yak cheese to have a lower overall fat content, but higher anti-carcinogenic/omega-3 fatty acids and protein⁴¹. These characteristics are all favoured by Western consumers⁴². Another key for marketing is that Sherpa chew Chhurpi for energy, nutrients, and salivation while mountain-climbing⁴³. In the West, Sherpa are associated with fitness and adventure⁴⁴. This connection would enhance both the ‘healthy’ and ‘exotic’

perceptions of Yakmac. Overall, selling Yakmac to Canadians would raise awareness about highland farming and promote tourism in Nepal.

Economics

KD includes approximately 220 g macaroni and 30 g powdered cheese. Currently, though the Nepalese Chhurpi price is \$12-\$17 USD/kg, the U.S. price is \$110/kg⁴⁵. Based on this price and the price for macaroni⁴⁶, Yakmac would cost \$3.43 (Chhurpi) +\$ 0.32 (noodles) = \$3.75, excluding packaging and transportation. Costs could fall by improving production efficiency and reducing exorbitant price disparities through the supply chain (i.e. Nepalese vs American Chhurpi prices). Yakmac will remain more expensive than KD (\$1.27/box⁴⁷), but as a specialty product, this may be tolerated.

Logistics

The Canadian market is accessible to Nepal, with no import duties or quotas^{48,49}. Dairy products, however, must be heat-treated, graded according to CFIA standards for dry milk products, and compliant with labelling regulations prior to import⁵⁰. The biggest obstacle for Yakmac is that Nepal is not free from Foot-and-Mouth Disease⁵¹. Nepal must either eradicate the disease, or Yakmac must receive approval from CFIA for an animal health import permit⁵².

Potential importers

Since Yakmac mimics a familiar product, it could be imported by any grocery store with a cheese import license⁵³.

1. **Loblaw's**

1 President's Choice Circle
Brampton, Ontario, L6Y5S5

2. **Metro**

11011, boul. Maurice-Duplessis
Montreal, Quebec, H1C1V6

3. **Sobeys**

115 King Street
Stellarton, Nova Scotia, B0K1S0

4. **Wholefoods Market** – a U.S. company with stores in Canada, they support ‘natural’ foods and sustainable agriculture. Ontario is served through the Chicago office:

640 North La Salle Street, Suite 300
Chicago, IL, 60654
312-799-5600

Conclusion

Yakmac offers a viable and unique opportunity for Nepal to export a value-added product to Canada. The macaroni industry is well-developed and could easily be amalgamated with the Yakmac industry. Yak dairy production, on the other hand, has been neglected despite its great potential. By addressing and overcoming associated market barriers, the Yakmac industry can improve the livelihoods of yak owners in the Nepalese highlands.

Endnotes

- ¹ Food and Agriculture Organization of the United Nations. (2013). *Top Exports – Nepal – 2011* [Data file]. Retrieved on October 15, 2014 from <http://faostat.fao.org/desktopdefault.aspx?pageid=342&lang=en&country=149>
- ² Food and Agriculture Organization of the United Nations (2010). *Dairy Sector Study of Nepal*. Retrieved on November 16, 2014 from <ftp://ftp.fao.org/TC/CPF/Country%20NMTPF/Nepal/thematic%20studies/Dairy.pdf>
- ³ Food and Agriculture Organization of the United Nations, 2010
- ⁴ Degen, A. A., Kam, M., Pandey, S. B., Upreti, C. R., Pandey, S. & Regmi, P. (2007). Transhumant pastoralism in yak production in the Lower Mustang district of Nepal. *Nomadic Peoples*, 11(2), 57-85.
- ⁵ Degen et al., 2007
- ⁶ Food and Agriculture Organization of the United Nations, 2010
- ⁷ Wiener, G. Jianlin, J. & Ruijun, L. (2006). *The Yak*, 2nd edition. FAO, Bangkok.
- ⁸ Pradhan, S. M. (2005). Dairy processing and farming in Nepal. Retrieved on November 16, 2014 from <http://www.fao.org/ag/agp/AGPC/doc/Proceedings/nepal2005/chapter20.pdf>
- ⁹ Thapa, 2002
- ¹⁰ National Forage & Grassland Research Centre, Nepal. (2007, July 9). *Yak and Chauri Farming in Nepal* [Website]. Retrieved on November 11, 2014 from <http://nfgrcnepal.blogspot.ca/2007/07/yak-and-chauri-farming-in-nepal-by.html>
- ¹¹ Pant, S. B. (2014, January 7). *Export potential of chhurpi discussed* [Website]. Retrieved on November 16, 2014 from http://www.myrepublica.com/portal/index.php?action=news_details&news_id=67573
- ¹² Food and Agriculture Organization of the United Nations, 2010
- ¹³ Degen et al., 2007
- ¹⁴ Bishop, N. H. (1989). From zomo to yak: change in a Sherpa village. *Human Ecology* 17(2), 177-204).
- ¹⁵ National Forage & Grassland Research Centre, 2007
- ¹⁶ National Forage & Grassland Research Centre, 2007
- ¹⁷ Wu, N. (2006). Social, Cultural and Economic Context of Yak Production. In *The Yak*, 2nd edition. FAO, Bangkok.
- ¹⁸ Yonzon and Hunter, 1991
- ¹⁹ Bishop, 1989
- ²⁰ Boland, M. (2009). *Agricultural Marketing Resource Centre: why value added agriculture is important* [Website]. Retrieved on November 18, 2014 from http://www.agmrc.org/business_development/getting_prepared/valueadded_agriculture/articles/why-value-added-agriculture-is-important/
- ²¹ Clark, E. A. (n.d.). Benefits of re-integrating livestock and forages in crop production systems. *Department of Plant Agriculture, University of Guelph*.
- ²² Yonzon, P. B. & Hunter, M. L. (1991). Cheese, tourists, and red pandas in the Nepal Himalayas. *Conservation Biology* 5(2), 196-202.
- ²³ Food and Agriculture Organization of the United Nations, 2010
- ²⁴ Kyle, J. (2009). *Ontario Ministry of Agriculture, Food and Rural Affairs: rotational grazing* [Website]. Retrieved November 18, 2014 from <http://www.omafra.gov.on.ca/english/crops/field/news/croptalk/2009/ct-0909a5.htm>

-
- ²⁵ Bishop, 1989
- ²⁶ Wright, D., Marois, J., Vargas, M. & Wiatrak, P. (2003). Perennial grasses, soil organic matter, and crop yield. In *Proceedings of sod based cropping systems conference, North Florida research and education centre*, 34-45.
- ²⁷ Atia, A. (2006). *Alberta Agriculture and Rural Development: applying manure on perennial forage* [Website]. Retrieved on November 18, 2014 from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex10727](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex10727)
- ²⁸ Government of Nepal: Ministry of Foreign Affairs. (2013). *Bilateral Relations (Nepal Canada)* [Website]. Retrieved on October 15, 2014 from <http://www.mofa.gov.np/en/bilateral-relations-nepal-canada-191.html>
- ²⁹ Raizada, M. (2014, September). Intro to breeding. *AGR 2150*. Lecture conducted at the University of Guelph, Guelph, Ontario.
- ³⁰ Degen et al., 2007
- ³¹ Food and Agriculture Organization of the United Nations, 2010
- ³² Bishop, 1989
- ³³ National Forage & Grassland Research Centre, 2007
- ³⁴ Bauer, K. M. (2004). *High frontiers: Dolpo and the changing world of Himalayan pastoralists*. Columbia University Press, New York.
In Jackson, D. S., Nydam, D. V. & Altier, C. (2014). Prevalence and risk factors for brucellosis in domestic yak *Bos grunniens* and their herders in a transhumant pastoralist system of Dolpo, Nepal. *Preventative Veterinary Medicine* 113, 47-58.
- ³⁵ Government of Nepal: Ministry of Cooperatives and Poverty Alleviation. (2011). *Department of Co-Operatives (DEOC)* [Website]. Retrieved on November 16, 2014 from <http://www.deoc.gov.np/index.php>
- ³⁶ Government of Nepal: Ministry of Agricultural Development. (2014). *Department of Food Technology and Quality Control* [Website]. Retrieved on November 18, 2014 from <http://www.dftqc.gov.np/>
- ³⁷ Government of Nepal: Ministry of Agricultural Development. (n.d.) *Department of Livestock Services* [Website]. Retrieved on November 18, 2014 from <http://www.dls.gov.np/>
- ³⁸ World Bank. (2009, June 4). *Project for Agriculture Commercialization and Trade (PACT)* [Website]. Retrieved on November 13, 2014 from <http://www.worldbank.org/projects/P087140/project-agriculture-commercialization-trade-pact?lang=en>
- ³⁹ Chapman, S. (2012, September). Manufacturing Taste. In *The Walrus*. Retrieved on November 13, 2014 from http://thewalrus.ca/manufacturing-taste/?utm_source=walrusmagazine.com&utm_medium=redirect&utm_campaign=move+old+website
- ⁴⁰ Reitsma, J. (2007, September 12). The Great Torontoist Challenge: Mac N' Cheese Edition. In *Torontoist*. Retrieved on November 17, 2014 from http://torontoist.com/2007/09/the_great_toron_3/
- ⁴¹ Or-Rashid, M. M., Odongo, N. E., Subedi, B., Karki, P. & McBride, B. W. (2008). Fatty acid composition of yak (*Bos grunniens*) cheese including conjugated linoleic acid and *trans*-18:1 fatty acids. *Journal of Agricultural and Food Chemistry*, 56, 1654-1660.
- ⁴² Government of Canada: Agriculture and Agri-Food Canada. (2010). *The Canadian consumer behaviour, attitudes and perceptions toward food products* [Website]. Retrieved on November 17, 2014 from <http://www.ats-sea.agr.gc.ca/can/5505-eng.htm>
- ⁴³ National Forage & Grassland Research Centre, 2007

-
- ⁴⁴ Kang, L., Zheng, H., Chen, F., Yan, S., Liu, K., Qin, Z., Liu, L., Zhao, Z., Li, L., Wang, X., He, Y. & Jin, L. (2013). mtDNA lineage expansions in Sherpa population suggest adaptive evolution in Tibetan Highlands. *Molecular Biology and Evolution*, 30(12), 2579-2587.
- ⁴⁵ Pant, 2014
- ⁴⁶ FAO, 2013
- ⁴⁷ Walmart. (2014). *Kraft Dinner Macaroni & Cheese* [Website]. Retrieved on November 17, 2014 from <http://www.walmart.ca/en/ip/kraft-dinner-macaroni-cheese/6000016946035>
- ⁴⁸ Embassy of Nepal: Ottawa, Canada. (2013). *Nepal-Canada Relations* [Website]. Retrieved on October 15, 2014 from http://www.nepalembassy.ca/index.php?option=com_content&view=category&id=14&layout=blog&Itemid=34
- ⁴⁹ Government of Canada. (2013). *Canada-Nepal Relations* [Website]. Retrieved on October 15, 2014 from http://www.canadainternational.gc.ca/india-inde/bilateral_relations_bilaterales/canada_nepal.aspx?lang=eng
- ⁵⁰ Canadian Food Inspection Agency. (2012b). *Milk and regulated milk products – import procedures* [Website]. Retrieved November 16, 2014 from <http://www.inspection.gc.ca/animals/terrestrial-animals/imports/policies/animal-products-and-by-products/2001-4/eng/1321120021415/1321120121634>
- ⁵¹ Canadian Food Inspection Agency. (2012a). *Foot-and-Mouth Disease – counties officially recognized by Canada as free of the disease* [Website]. Retrieved November 16, 2014 from <http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/foot-and-mouth-disease/countries-recognized-as-free-of-the-disease/eng/1330483635966/1330483942804>
- ⁵² Canadian Food Inspection Agency. (2013). *Import and interprovincial requirements for dairy products – overview* [Website]. Retrieved November 16, 2014 from <http://www.inspection.gc.ca/food/dairy-products/imports-interprovincial-trade/eng/1300214060169/1300214161699>
- ⁵³ Canadian Food Inspection Agency (2014). *Cheese import licensing* [Website]. Retrieved November 16, 2014 from <http://www.inspection.gc.ca/food/dairy-products/manuals-inspection-procedures/product-inspection/dairy-import-activities/eng/1335877096502/1335878112465?chap=5#s5c5>