

“Eating Hay”: The Ecology, Economy and Culture of Viliui Sakha Smallholders of Northeastern Siberia

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Abstract Contemporary rural Viliui Sakha of northeastern Siberia, Russia, are a Turkicspeaking people practicing horse and cattle breeding in the subarctic. This article details their story of survival in the north as one not only of adapting a southern subsistence to an extreme climate but also to the effects of Russian colonization, Soviet collectivization, and post-Soviet decentralization. In the post-Soviet period a majority of rural Viliui Sakha adapted to the loss of a centralized agro-industrial state farm system by developing a smallholder food production system relying on cattle husbandry supplemented with other subsistence sources including fish, game, forage, other domesticates, and garden products. In the twenty-first century, this “cows-and-kin” system represents a resilient smallholder adaptation based on reviving pre-Soviet production knowledge, recalling ecological knowledge, and relying on kin. The article concludes with a discussion of the future of cows-and-kin by exploring issues of alienated youth, accessing land and the overwhelming concern of inhabitants about the local effects of global climate change.

Keywords Smallholders system · Viliui Sakha · Resilience and adaptation · Post Soviet · Siberia

Introduction

My father-in-law often commented, “We are eating hay,” when I would prepare a salad to add to the meat and milk

fare on our table. His remark is insightful. Besides the herbs and grasses his ancestors would add to milk and meat dishes, vegetables remained a fairly foreign part of the diet to horse and cattle breeding Sakha of northeastern Siberia, Russia, even in the contemporary context. Concomitantly, Sakhas’ dependence on hay has been and remains strong due to the need to fodder cows in barns for the long 9-month winter and provide supplemental feed for horses. In this way, my father-in-law and his people have for millennia been “eating hay.” Representing the highest latitude horse and cattle breeding peoples in the modern world, the Viliui Sakha food production system is a unique case of smallholder agriculture in the sub-arctic.

Sakha are a Turkic-speaking indigenous people of Siberia, at present numbering approximately 350,000 and inhabiting one of the most economically progressive areas of the Russian Federation (Tichotsky 2000). Sakhas’ Turkic ancestors migrated east from central Asia to the Lake Baikal regions of southern Siberia in the sixth and seventh centuries, then northward to the middle Lena following their defeat by the armies of Genghis Khan in the fourteenth century.¹ Being keepers of horses and cattle, they were drawn to the lush hay fields of the northern river regions of the Lena, Viliui and Aldan. Sakha living along the Viliui watershed became known as Viliui Sakha. The climate was harsher than their previous southern residence—but they had ample hay lands in the northern regions and an abundance of hunting and fishing resources. They kept indigenous breeds of cattle and horses, which could live outdoors year round and find their own fodder under the snow. Sakha horse and cattle

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¹In the late twentieth century archaeological remains of an entire cattle and horse raising settlement in the central regions of Sakha dating back to the thirteenth century added archaeological evidence for these migration (Gogolov 1993:3).

husbandry was their main subsistence strategy in their former southern residency and in their new subarctic home.

In the post-Soviet context Viliui Sakha continue to raise cows and horses. They now keep domestic cattle, that need protection in barns for approximately 9 months of the year, and for which they spend most of the brief subarctic summer cutting hay for, a lifestyle considered key to survival by the majority of rural Viliui Sakha. Keeping cows in the subarctic is highly labor and energy intensive.² From a commercial production standpoint, it is not cost-efficient. From a cultural standpoint, cattle keeping is for Sakha what Julian Steward defines as their “culture core” or, “the constellation of features which are most closely related to subsistence activities and economic arrangements; the cultural–ecological nexus of a society” (Steward 1955; Steward and Murphy 1976: 34).

This article examines the Viliui Sakhas’ contemporary smallholder system in the context of relevant history, geography, culture and economy. To these ends, the article first explores Viliui Sakha adaptations to their extreme environment, to Russian colonization and the Soviet and post-Soviet periods. This is followed by a close-up of contemporary life and the Viliui Sakhas’ smallholder system. The article concludes with a discussion of three issues relevant to the future of cows-and-kin; access to land, alienated youth, and unprecedented climate change.

The fieldwork contributing to this analysis occurred over the span of half a dozen research projects between the years 1991–2005 in four villages in the Suntar region and employed both qualitative and quantitative research methodologies including household surveys, time allocation observations, household economic diaries, sequential elder life history interviews, archival research necessary to fill out the local historical record, focus groups and semiformal interviews with local, regional, and state specialists.

Geography and Culture

The Sakha Republic, an area of over three million square kilometers, occupies 20% of Russia’s total area (Fig. 1). However, due to the region’s extreme climate, it is home to only 1% of Russia’s population. Most rural communities depend on “traditional” subsistence strategies of either horse and cattle husbandry or reindeer herding supplemented by fishing, hunting and foraging. Sakha constitute

the ethnic majority of the Viliui watershed. The other indigenous peoples inhabiting this subarctic terrain include Evenk, Even, Yukagir and Dolgan.

The Viliui river winds over 1,643 mi from its headwaters in western Krasnoyarsk Krai to where it joins the Lena river just north of the Republic’s capital city, Yakutsk. The predominant ecosystem of the Viliui watershed is *taiga* (boreal forest) interspersed with *alaas* (a round lake bordered by hay fields that transition to taiga). Other micro-ecosystems include meadow and forest steppe systems, both with steppe flora, a sandy desert biome, swamplands, and, in the northern parts of the watershed, tundra with alpine meadows.

The climate of Eastern Siberia is sharply continental, with annual temperature variations exceeding 100°C, from +40°C (+104°F) during the summer to –60°C (–76°F) in winter. The annual change in day length is also extreme, with the shortest winter day at 4 h and 14 min and the longest day in summer of 19 h and 45 min.

Sakha Adaptations to the Extreme Subarctic Climate

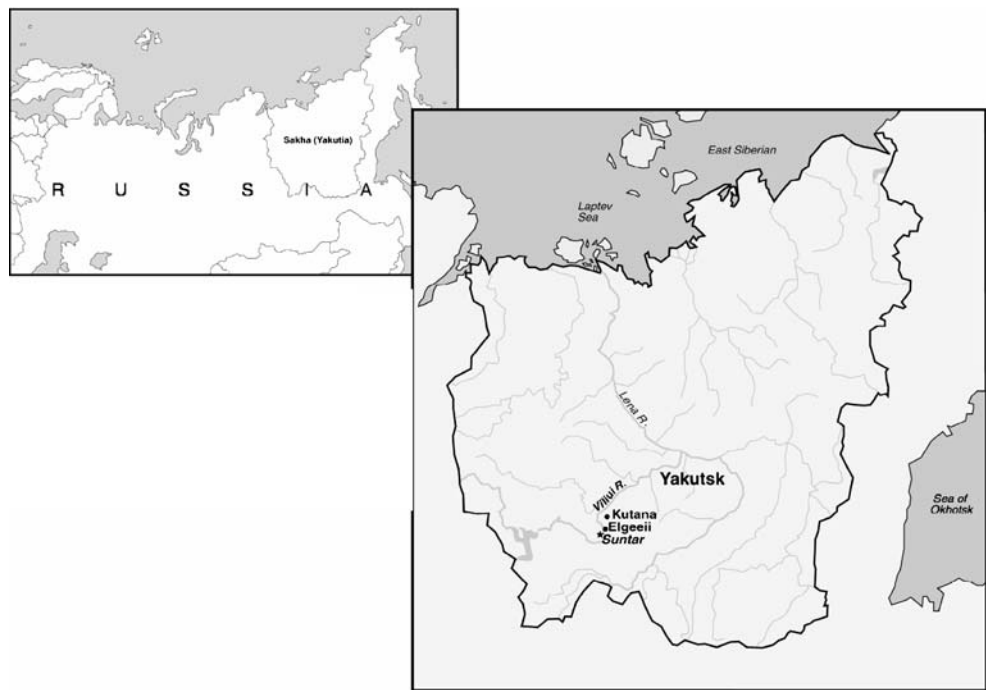
Historically, human habitation of the Old World taiga regions, adjacent waterways and coastal areas has been dominated by reindeer herding and foraging cultures due to the limitations of the high-latitude ecosystem for land cultivation and domestic animal breeding. Tungus (Even and Evenk) and Tumat, who preceded Sakha the Viliui regions, subsisted by a mixture of reindeer herding and hunting, gathering and fishing (Crate 2003d). Some depended mostly on breeding indigenous reindeer to fill all their food, clothing and transportation needs, traveling with their deer as grazing needs demanded. Others depended mainly on hunting, fishing and wild plant gathering.³

Sakha were the first to establish agropastoralist subsistence in this subarctic ecosystem. This success was due to several factors: (1) the wealth of natural hay fields throughout the Viliui regions, (2) their core cultural subsistence practice of horse and cattle husbandry and, (3) their ability to harvest sufficient hay to over-winter their herds. Adapting to the extreme subarctic climate they changed from a southern nomadic lifestyle to the practice of semi-nomadism, moving between a summer and a winter home. In winter they lived at higher elevations to avoid spring floods, most often in wooded areas to preserve precious pasture and hay lands and to have direct access to firewood. They moved to their

²There is only one other case of people in the world having kept cows in a subarctic climate, and they have long vanished due to their inability to adapt to local conditions once the climate changed (McGovern 1980: 245–275).

³It is quite feasible to assume that these two subsistence modes were practiced simultaneously as one became more favorable due to fluctuation in local climatic (Krupnik 1993).

Fig. 1 Map of Russia with close-up of Sakha Republic and the Viliui Regions



summer dwellings when the grass began to grow. Summer dwellings were located in woods on the edge of hay lands where animals could roam freely and graze. Adjacent fields were cut for winter forage stores. Summer homes were located near forage areas for berries, plants, and fish.

The winter house, or *balaghan*, was small in area to conserve heat and simply constructed to utilize a variety of timber sizes. The cow barn adjoined the living area as a source of heat. In cross-section *balaghans* were trapezoidal shape with vertical timbers placed against a pole frame in such a way that the walls gently sloped inward towards the top. Each autumn the household would seal the structure with at least three layers of fresh cow dung, each with a specific thickness and drying time for optimum insulation and impermeability. Snow was also piled high around the *balaghan* for insulation. Windows were made of either cow stomach stretched tightly over a frame, resembling an open fire pit lined with clay a drum head, or, in winter, ice. The *balaghan* was wood-heated by a central *komuluok*, an open fire pit lined with clay, or woodstove and body-heated by the household's herds. The smoke escaped through a clay-covered stick chimney. There was no flue and the *komuluok* burned constantly to provide heat.

One advantage to herding in the subarctic was that meat storage was possible for a 6-month period in the open air or year-round in an underground storage pit.⁴ Sakha

slaughtered and stored meat either in a protected outbuilding or in a *buluus* (underground storage area). Sakha used all parts of their animals. They manufactured their shirts, pants and dresses from calfskin sewn with horsehair. They made coats, boots, hats, leggings, and similarly heat-capturing muffs, gloves and accessories from fur-bearing animals.

For water Sakha relied on adjacent rivers, streams or lakes. When these froze over, they either harvested and melted ice or made a *tammakh* (literally “water drop”) to melt snow, consisting of a forked branch packed solid with snow which hung by the *komuluok* and dripped into a birch-bark pan. In winter domestic animals drank directly from the water source via an *oibon* or round hole cut in the ice. These ice holes were protected from freezing with several layers of insulating material, most commonly animal hides. Utensils and containers were made of readily available materials, mainly birch bark and wood, and sewn with animal hair.

The horse, the most highly regarded domestic animal for precolonial Sakha, was their major mode of transportation, and supplied food and materials for clothing. Sakha regarded their riding horses as their closest friends, and dedicated many rituals and traditions to their horses in honor of their service. They intricately decorated their horses when saddled to ride, above and beyond any utilitarian need. These beliefs and traditions were based in Sakhas' Tatar-Mongol origins.

Precolonial Sakha depended to a lesser degree on cattle. They used an indigenous breed, or *Bos taurus* Sakha (Yakut) breed, which was much better adapted to the environmental

⁴Similar southerly cow cultures rely mainly on milk and blood, only consuming meat for special feasts. Excellent examples in temperate Africa include the Nuer and the Turkana (Evans-Pritchard 1940; Little and Leslie 1999).

conditions than the European strains introduced in the early Soviet period.⁵ Indigenous Sakha cattle are well-adapted to the harsh subarctic climate, with a well-developed capacity for thermo-regulation and a low rate of metabolism at low temperatures. They lived in unheated barns and stayed outside even to temperatures of -50°C . Sakha cattle found the majority of their fodder under the snow and utilized a variety of grasses and other plant materials, similar to a modern goat. They were even known to graze in the surrounding forestlands, were not afraid to graze in swamps, and could swim across the river if they needed more pasture on the other side. Sakha did not let their cattle roam and graze freely through the winter as they did their horses, because they continued to milk the cows and depended on their body heat for their dwellings. The Polish ethnographer Seroshevski, writing in 1896 about Sakha culture and environment, referred several times to Sakha cattle,

The Sakha cattle can stand bad weather, hunger, cold, eat everything (twigs of birch, aspen, willow, cane and fodder under the snow), eat very little, fatten quickly, and survive for a long time off their own fat reserves (144–149).

Similarly, Richard Karlovich Maak, a German researcher who traveled among and wrote extensively about Viliui Sakha of the late nineteenth century, detailed Viliui Sakha horse and cattle subsistence practices (Maak 1994). He emphasized that although Sakha cattle gave less milk per day on average than European breeds, their milk was higher in fat content and produced more butter and cream per liter of milk. They were more efficient in “milk manufacture,” using only 65% of the feed that European breeds need to produce an equal amount of milk.

Sakha used milk reserves for *taar*, a fermented milk mash, a mainstay of the pre-Soviet Sakha diet. Milk reserves were kept in the root cellar in a *chabychakh*, a shallow and wide birch container, and the cream skimmed off the top daily. When this milk soured, it was boiled and cultured into yogurt. This was the base for *taar* and as more and more milk soured during the summer bounty, it was added to the *taar* and the winter stores increased. *Taar* was eaten throughout the winter like a runny yogurt by whipping a small amount of water into it, either plain or with the addition of wild grasses, herbs, and pine or larch pulp. Additionally, the *taar* stores were continuously supplemented with table scraps—fish, duck and other small game bones, berries and herbs. Sakha also used a lot of their milk reserves for *khaiakh*, made in the same manner as butter but with added soured cream. Another favorite food

was *kurchuk*, which was whipped cream sometimes with added berries for flavor.

Prior to the Russian introduction of domestic vegetables and grains Sakha relied on wild plant resources to supplement their diet. Most Sakha used pine and larch trees to make their flour. In June or July Sakha cut down a tree, removed the bark, and stripped out the sapwood in long pieces. They then dried these pieces in the sun, sometimes first drying them with fire to prevent spoilage. When fully dry, they were tied in bunches and hung in a dry place until ground into a flour with the use of a *keli* (hand mill). To prepare meals, the Sakha usually boiled some *taar* in a clay pot and added several handfuls of ground sapwood, as well as some fresh milk and dried herbs for taste.

In addition to sapwood, Sakha gathered ten to fifteen different wild plants, including wild lilies, onions, horse-radish, plantagoes, angelica, and rumex. They also made use of a variety of wild berries that grew in the nearby woods and fields. However, their reliance on berries was limited to seasonal harvest since they had no sugar to preserve with. They had no cultural predilection to eating mushrooms prior to Russian colonization even though the woods were full of four or five varieties. Of special interest are the indigenous grains Sakha used including wild oats (*Bromus inermis* and *B. ciliatus*), barley (*Hordeum pratense* and *H. jubatum*) and rye (*Elymus dasystachys* and *E. excelsus*), which were ground and made into a gruel called *salamaat*. They also made *kasha* or gruel from many plants of the plantago family, including *Plantago major*, *P. paludosa*, *P. asiatic*, *P. canescens*, and *P. media* (Seroshevski 1993:63–64).

The practice of domestic gardening and agricultural production, first of grains then potatoes and to some extent other vegetables, was introduced by early Russian Cossacks and clergy. Vegetables, including cabbage, turnips, carrots and cucumbers although documented in Suntar as early as 1794, were not as commonly grown among Sakha households (Basharin 1990:38). Grain agriculture was first documented on the Viliui in 1760 and was a fairly common practice on a household level among both Russians and Sakha by 1864 (Basharin 1989:206). Likewise, by 1842 many Sakha households practiced potato cultivation (Basharin 1989:275). By the early twentieth century the majority of Sakha households maintained a grain and a potato field.

Sakha hunted sable, bear, ermine, fox, bobcat, squirrels and hares. Hares were most important for Sakha household subsistence and in good years it was not uncommon for a household hunter to catch 20 or more, which provided substantial meat and fur. Sakha caught waterfowl with snares and traps in the fall and spring. They relied only on spears, bows and arrows for hunting until the mid-1700s when they gained access to rifles. They continued to rely heavily on traps, the most widely used being the *samostrel* (self-firing

⁵This aboriginal breed is now being raised at three locations in the Sakha Republic.

crossbow) for hares, fox and even reindeer. Only the Tungus would hunt a bear “head-on,” with spear and bow. Sakha usually bear hunted when the bear was in its den and used spears and rifles in a hunting party of 20 or so.

Precolonization Sakha social structure was highly stratified, with wealthy Sakha clan heads maintaining large herds on extensive pasturelands and hay fields. They exercised rights to keep others off their lands and to pass them on to their kin, and reaped ‘rents’ from smaller herd owners who used parcels in return for a percentage of hay or animal produce. The rest of the population either worked for the wealthy clan heads or developed mixed subsistence patterns relying more on the indigenous Tungus strategies of hunting, fishing and foraging. In the Viliui regions domestic meat was the main meat source only for better off households who had ample hay fields. Fishing was a more important source of sustenance than hunted sources, especially for the poor Sakha. The most important fish species were *mundushky*, (*Cyprinus perenurus*), a small and bitter fish which is extremely time consuming to catch and clean, and *sobo* (crucian carp, *Carassius carassius*), caught using one of two main methods—*kuyuur* and *mungkha* both requiring exact tools.

Table 1 Sakha Months and Correlation to Subsistence Activities

Sakha month	English month	Sakha meaning
Bes Yia	June	“Pine” month, marking the month to harvest pine
Ot Yia	July	“Hay” month, marking the beginning of the haying season
Atyrjakh Yia	August	“Pitchfork” month, marking the time to make the stacks of hay
Balaghan Yia	September	“Winter home” month, the time to move to the winter home
Altyunny Yia	October	“Sixth” month
Setinni Yia	November	“Seventh” month
Aksynny Yia	December	“Eighth” month
Toksunnu Yia	January	“Ninth” month
Olunnu Yia	February	“Tenth” month
Kulun Tutar	March	“Holding the Colts” month, marking the time to hold the colts from their mothers so households can consume some horse milk
Muus Ustar	April	“Ice Going” month, time to remove the ice balaghan windows.
Yam Yia	May	“Spawning” month, marking the month the fish spawn

Up until the 19th century, Sakha divided the year into 13 months, following lunar cycles. Since that time they have conformed to a 12-month system with many months named according to their subsistence practices (see Table 1). Sakhas’ main agricultural practice was harvesting hay to fodder their herds. Before Russians introduced the European scythe, Sakha used a straight scythe, which they swung over their head. Sakha waited until the end of the summer to harvest the hay when it was at its prime ripeness and peak biomass. The only exception to this custom of late harvest were the rich who had more land and had to begin early in order to cut it all. If Sakha were unable to cut sufficient hay grasses, they would supplement the harvest with less palatable plants, including straw, lake reed, tussocks, larch branches and assorted shrubs.

The need for large amounts of hay to over-winter their herds made Sakhas’ main activity in temperate months not only hay harvesting but the battle against encroaching trees and shrubs. The main method of pasture-making was burning (Nikolaev 1970). The second method was the draining of existing lakes. One favored method was to drain the lake partially, leaving the exposed perimeter a fertile hay area for the first few years and the lake fish preserved for exploitation during the same period. Total drainage was a much more complicated process requiring indigenous specialists who knew the land and could decipher how to build canals to properly drain the water. The canals often went through surrounding forests of old larch trees and required intensive labor with axes, picks and shovels.

Nikolaev (1970) also gives insight into fertilizer use. Up until the Soviet period Sakha relied on natural fertilizers from burning of fields and animal manure. During collectivization fields were widened, especially when the first tractors were introduced in the late 1940s. After WWII the traditionally used natural fertilizers were replaced with super-phosphates and other chemical fertilizers.

Sakha Worldview and Ritual Cycle

Sakhas’ smallholder system, historically and now, is founded upon a worldview that all in nature is spirit possessed (Maak 1994:280–297; Seroshevski 1993:593–655; Jochelson 1933:103–106). According to the traditional Sakha belief system, the world has an upper, a middle and a lower realm. The upper world, *Khallaan*, is home to the *aiyy* (gods), the pantheon of sky deities. *Khallaan* is nine-tiered, with each level a home to one or more deity protectors. The highest place is held by *Urung Aiyy Toion*, the “Great Lord Master,” creator of all the universe. All the deities below him are manifestations of his essential power. Of the pantheon of deities, those most highly regarded and recognized in ritual are *Urung Aiyy Toion* (the highest and

creator of all), *Juhugey* (the horse deity), and *Aan Alakhchyn* (the deity of spring and fertility).

The middle world, *Orto Doidu*, is inhabited by earthly beings and *ichchi*, the spirit keepers of nature. Sakha believe that trees, rocks, words, and all things animate and inanimate have *ichchi*. Although there is no clear hierarchy of *ichchi* (as in the *aiyy* pantheon), the fire, the forest, and the earth *ichchi* are the most highly regarded and commonly recognized in ritual. *Wot ichchite*, the spirit protector of the fire and home hearth is personified as a gray-haired elder who serves as the conduit through which sacrifice in the form of libations, gifts of food, and trinkets find passage to the upper world *aiyy*. The earth *ichchi*, *Jaajay Baraan Khotun*, is personified as an old woman, an image carried over “from the times when women held a central role in society” (Ergis 1974:117). The spirits of plants in the form of tiny children assist her by cleaning and dusting the leaves and grasses. Sakha traditionally made offering to *Jaajay Baraan Khotun* when foraging, haying, and moving to their summer home. During hunting, Sakha pay tribute to *Baianai*, the spirit keeper of the taiga, forest and all wild animals, personified him as a jolly red-or black-haired elder wearing a coat of reindeer skin and riding a reindeer or running through the forest.

The lower world, *Allaraa Doidu*, is an impassable swamp where iron trees and plants grow, inhabited by *abaahy* (evil spirits or devils) representing the source of all existing and potential evil. The daily rituals of feeding the home hearth and the annual calendric ceremonies marking the annual moves in late May or early June and early September between winter and summer homes provide protection from the *abaahy*. Central to this defense are the daily rituals of feeding the home hearth and the annual calendric ceremonies.

When Sakha made the annual move in late May or early June from the *balaghan* (winter home) to the *saylyyk* (summer home), the family performed a ritual called “the hanging of the salama (a rope of twisted black and white horse’s hair adorned with pieces of colored fabric, animal figures made from birch bark, duck beaks and fish bones)” soon after arriving to the *saylykh* area. Then the ritual moved to the lake adjacent to the *saylykh* where the family hung the, as a gift to the lake *ichchi*. Following the ritual, the seasonal work began. Sakha pastured and tended to their herds. They hunted duck and other wild game and gathered wild herbs, plants and berries for winter use. They took birch bark from the trees and made a variety of containers and utensils. July was haycutting time, when Sakha families cut, gathered, and stacked sufficient hay for winter fodder. The hay-cutting season began with a ritual ceremony in honor of the earth spirits and sky deities. Early September meant a return to the *balaghan*, a move also marked with a ritual ceremony.

Rituals, each recognizing the appropriate sky deities and earth spirit protectors, also marked the births of people, cows, and horses. For example, ceremonies marking a human birth honored and welcomed the fertility deity, *Aiyyhyt*, who is believed to assist for three days following the birth. On the third day, *Aiyyhyt* leaves the mother, and a special ceremony in her dedication is held. Only women were allowed in this ceremony and, with their faces smeared with hot fat, were to laugh hysterically. The stronger they laughed, the more pleased *Aiyyhyt* would be and the greater the insurance was for the lifelong happiness of the new child (Kulakovski 1979).

Sakha sometimes called on an *oiuun*, or shaman, for certain ritual assistance. The *oiuun* is a person born with or indoctrinated into possessing supernatural powers, played a central role in Sakha belief. The white shaman’s main role was as a benevolent priest whose powers were limited to the realms of goodness and fertility during the *yhyakh* festival (Crate 2006a). The *khara*, or black, *oiuun*, could utilize both the powers of good and evil. With these powers, the *oiuun* entered the lower and upper worlds and serves as mediator for humans with these spirit worlds.

Sakha summoned a *khara oiuun* (black shaman) to combat illness and bad fate. The *oiuun* knows which *abaahy* (the evil spirits inhabiting the underworld) are the source of the malady, and his/her soul travels between the three worlds to fight that source. This travel involves riding the *oiuun*’s “spirit horse,” whose rhythmic canter is personified by the *oiuun*’s beating of the ritual *dungur* (shaman drum) along with the *oiuun*’s spoken and sung prayers (Alekseev 1975:162). In the upper world, the *khara oiuun* appeals to the benevolent deities. Reaching the lower world, the *oiuun* chases the particular *abaahy* away, and thereby heals the ailing person. According to the historical record, the *khara oiuun* traditionally conducted the annual fall blood sacrifice of horse or cattle to the *abaahy*, a ritual event no longer practiced (Troshanski 1902:130).

For 500 years prior to the seventeenth century, Viliui Sakha practiced subsistence agropastoralism in relative isolation from the outside world. They did so by adapting a southern horse and cattle breeding smallholder system to the sub-arctic via foddering their herds, harvesting within the brief window of summer, and relying on a spiritual belief that defined and delimited their interactions with the natural world.

Russian Colonization and Soviet Influence on Viliui Sakha Smallholders

For 500 years prior to the seventeenth century, Viliui Sakha practiced subsistence agropastoralism in relative isolation from the outside world by adapting a southern horse and

cattle breeding smallholder system to the subarctic. With the advent of Russian military outposts and colonization in the mid 1600s, the newcomers demanded *iasak* (fur tribute) from Viliui Sakha, based on a prescribed number of fur pelts per household. This put new demands on Sakhas' already challenging subsistence strategies.⁶ It became commonplace in the centuries that followed for Russian colonists to seize land and precious resources such as gold, furs, and salt.

The Soviet collectivization process brought more pervasive changes. Beginning in the late 1920s and culminating in the late 1950s, Soviet-era collectivization transformed the Sakha land use strategy from extensive to centralized. In the early years of collectivization all inhabitants were either overtly or covertly forced to turn over their land rights and privately owned resources, including animals, to the collective farms. The Soviet push to industrialize meant collectivization and consolidation of lands and herds along with exploration and exploitation of natural resources across the country. In the Viliui regions, the discovery of diamonds in the late 1950s, and consequent rapid development of the diamond mining industry to extract them, created an influx of industrial workers (Crate 2003c). This disproportionately raised the demand for meat and milk products. Accordingly, in 1957 Viliui Sakha were consolidated into the Elgeei State Farm whose central objective was to supply the nascent mining communities with meat and milk. From the 1950s through the 1970s, the Elgeei state farm flourished along with the diamond industry (Tichotsky 2000). Beginning in the mid-1980s, on the heels of *glasnost* (openness) and *perestroika* (restructuring), the direct flows of needed farm products in exchange for farm subsidies began to wane as the diamond industry grew more transnational. In the late 1980s the state farm lost much of its direct subsidy and the diamond company turned south, most notably to Novosibirsk and Irkutsk, from where they could import the same products at far reduced prices. Then, with the demise of Soviet power in 1991, the encompassing agrarian infrastructure collapsed, presenting Viliui Sakha with a variety of challenges and opportunities related to defining new subsistence strategies, given the limitations of their natural environment, in the post-Soviet context.

⁶Additionally, it also heavily impacted fur-bearing animal populations in the Viliui and across Siberia which, beginning in the mid-1600s, was Imperial Russia's main source of economic growth, based on the abundance of "soft gold," or sable and other precious fur-bearing animals, but was thrown into economic decline began in the early nineteenth century due to over exploitation of those fur resources (Bassin 1991).



Fig. 2 A yard in a Sakha village showing ample room for barn and storage for food and other equipment

Post-Soviet Subsistence Adaptations

The 1991 break-up of the Soviet Union⁷ and the dissolution of the Elgeei centralized farm system, resulted in a paucity of food staples including meat, milk, milk products, potatoes, vegetables, and grains in village stores. This stark change in consumer supply motivated households to develop a smallholder food production system termed "cows-and-kin," an adaptation based upon pre-Soviet Sakha subsistence practices (Crate 2003a). In the twenty-first century, this cows-and-kin system represents an historically-based resilient smallholder adaptation based on reviving pre-Soviet production knowledge, recalling ecological knowledge and relying on kin (Crate 2003a). The success of cows-and-kin, in turn, depends on accessing elder knowledge about cow care, land use and production technologies (Crate 2002). Although now, stores are more bountiful, home food production remains essential if a household desires access to a regular supply of the staple Sakha foods of meat and milk, as well as fresh potatoes and other vegetables, wild berries and wild meat and fish. Cows-and-kin is the locus of this smallholder system.⁸

Cows

Contemporary Sakha villages are in many ways built for cows. Each household's allotted yard has ample room for a *khoton* (cow barn), for open-air corrals and for the storage of cow food and cow-related equipment (Fig. 2). Similarly,

⁷I collected the main data for this specific study with Viliui Sakha households in Elgeei and Kutana villages of the Suntar region, Sakha, between July 20, 1999, and June 16, 2000. I used both qualitative and quantitative research methodologies including household surveys,

⁸It is important to note here that although all households do not keep cows, the majority access cow products and the other supplemental sources important to household food production via kin households that do produce these products.

Table 2 Age-sex Groups and Time in Cow and Hay Activities

Age-sex and cow status	Percent (%) time in daily cow care	Percent (%) time haying
All cow-keeping households	10	4
Male elders	20	6
Female elders	17	3
Male adults	10	8
Female adults	10	1
Male youth	1	5
Female youth	3	1
Male children	–	2
Female children	1	1
All non cow-keeping households	0.5	1.5
Male elders	–	3
Female elders	0.3	–
Male adults	–	3
Female adults	0.2	–
Male youths	–	–
Female youths	–	–
Male children	–	–
Female children	–	–

each qualifying household is allotted an area within the village territory for hay harvesting to fodder their herd.

Keeping cows requires labor and time. Based on the results of time allocation observations, cow-keeping households spend one-tenth of their waking hours in the day-to-day duties of cow care and an additional 4% of their annual time for seasonal haying. Non-cow-keeping households spend one half of one percent of their time in daily cow care,⁹ and 1.5% of annual time helping with haying. Of the household members most typically involved in cow care (adult heads/elders), the male elders of cow keeping households spend one-fifth of their waking hours in cow care, female elders spend one-sixth, and male and female adults one-tenth. Male adults and male elders spend the highest percentage of their time haying. But haying is a crucial activity and most are called into action across the age-sex groups (Table 2).

Summer is the least labor intensive period in regards to daily cow-keeping chores. Of the dairy-keeping households,¹⁰ summer cow care took from 2 to 4 h a day, the

⁹Non-cow households are often called upon to help cow households, especially when they have an interdependent relation with them—they get products in return for labor.

¹⁰During my 1999–2000 full year of research, I contracted 11 household heads to maintain an economic diary for the full year including all expenses and income, domestic production, trade and bartering, social events and weekly menu. I chose these households to represent a range of household make-up, economic and productive activity, and sources of kin relationships.

difference a result of the cow tenders being young or elderly. In these temperate months from the end of May through early September, cows go to pasture each morning after milking and return in the evening to be milked again. In winter, when they spend most of their time in the *khoton*, daily cow-keeping involves morning feeding, milking, and the cleaning and hauling of manure from the barn, mid-day feeding, and evening milking, feeding and manure cleaning and hauling. This daily cycle can take diary households anywhere from 3 to 6.5 h. The most demanding time is when cows calve, which usually occurs during April and May. The extra time in calf tending ups the daily cow care time to from 5 to 7 h. In addition, the straining, separating, and overall “transformation,” of the milk into the various milk foods can take an additional 1–2 h daily. In the majority of households surveyed it was the elderly and adult women who perform these daily tasks.

In addition to the daily regime of milking and general cow care, the harvest of sufficient hay to over-winter herds is a major expenditure of time and resources. Households need two tons of hay for each cow with a new calf to feed them over the winter. For this the household needs the land, the tools, the labor and the machinery to harvest and transport the hay back to their homes. The amount of hay that a household can harvest appears to be the limiting factor that determines the number of cows a household can keep over the winter. When asked what they do if they can not cut sufficient hay to over winter their herd, the overwhelming majority of participants said they find some other means of getting the hay they needed by buying, haying on rented or borrowed land, or bartering. Only a small percentage of households surveyed said they would consider slaughtering some of their herd if hay stores were insufficient. All of these households were low-income with no excess resources to buy the hay they needed and with no kin locally to exchange labor for cow products.

In the severe winters, with the cows themselves as the only source of heating, barn size is critical. Barns are built with a certain cow number in mind. Many informants house their cows at a kin household where their additional cows make the barn’s internal temperature suitable for all. If your barn is too big, your cows freeze and if it is too small your calves get trampled. Because of this, another major summer activity is the down- or upsizing of *khotons*.

Having cows and the daily care they require ties a household to their *khoton*. However, most informants didn’t consider this a bad thing. The majority of cow-keeping households today grew up with cows and got their cows when they married from one or both of their parents. Some said they keep cows to have something to do. Those who had cows all their lives and who, for some reason, no longer keep them, complain that their lives are meaningless and they don’t know what to do with their time.

Table 3 Percentage of Kin Households that Share Broken Down by Village

Product category	Elgeei		Kutana		Both	
	No. of households	Percent (%) share	No. of households	Percent (%) share	No. of households	Percent (%) share
Cow products	124	65	63	92	187	79
Horse products	42	69	26	88	68	79
Pigs and/or chicken products	42	26	21	33	63	30
Garden produce from gardens	147	53	62	56	209	55
Berries from foraging	137	81	58	86	195	84
Ducks from hunting	126	58	60	66	186	62
<i>Sobo</i> from fishing	109	75	61	85	170	80

Kin

Besides cows, the other major survival tool in the villages today is kin. Kin is the main operative ideology of intracultural relationships for the majority of world cultures (Morgan 2000; Engels 1985; Schneider 1984; Needham 1971; Collier and Yanagiasko 1987; Faubion 1996; Goody 1990). Kin as a major source of household labor and exchange of goods is nothing new to Sakha or other cultures across the world (Netting 1993; Humphrey 1998; Wilk 1999). What makes kin relations for the Sakha interesting and compelling is understanding the extent to which kin networks have functioned as such over time and the extent to which they are being rediscovered and utilized anew after a long period of political oppression and economic abundance and stability.

Indicators about inter-kin-households sharing show one angle of existing relationships in the two villages. One-third of households keeping pigs and chickens share these products with their kin. Of those with gardens, a little over half share their garden produce with kin. Eighty-five percent of households who forage for berries share their berry crop with kin. Similarly, over half of all duck hunting

households share a substantial portion of their ducks with non-hunting kin households. Over three-fourths of *sobo*-fishing households share their catch with kin (Table 3).

Other Sources that Supplement Cows-and-kin

Viliui Sakha households and their kin are involved in a variety of other subsistence activities in order to supplement the central cows-and-kin strategy including other domesticates and foraging (plants, fish, animals).

Horses

For most of Sakha history horses were more important to household food production than cows. I first learned of Sakhas' horse use while conducting field research for my master's thesis in the summer of 1992, analyzing Sakhas' traditional summer festival (Crate 2006a). There are advantages to keeping horses. Horses need fewer inputs and less hay than cows. They also require less tending time. They don't need barns since they stay outside year round and only require care in mid-winter for supplemental

Fig. 3 Small greenhouse (a), Large greenhouse (b)



HORTICULTURAL CALENDAR

Jan	Feb	Mar	April	May	June	July	August	Sept
Prep soil for indoors Start pepper seeds		Start tomato seeds Transplant sprouts to ind. Containers	Start cucumber, Squash, flowers, etc Put plastic on grnhse Harden plants in grnhse	Prep grnhse soil Plant greenhouses Plant early crops in open	Plant potatoes Plant greenhouses Prep open beds Plant open beds Harvest first fruits		Maintain gardens Maintain grnhse Hill & water potatoes Plant fall crops in open Fertilize beds & grnhse	Harvest potatoes Harvest grnhse Take up grnhse Harvest open beds Prep soil for next yr
							Begin harvest to can	

Fig. 4 Horticultural calendar

feeding and assistance in birthing in the outpastures where they can be found. Horses can produce offspring that can be eaten the next fall whereas a cow's offspring needs at least a 2-year growing period to have enough meat for a productive slaughter. Horses, although they do produce milk, do not have the milk production of cows and, for that matter, contemporary households are not predisposed to milking mares for household milk use. Despite the lower inputs for horses over cows, the majority of households continue to keep cows, mostly for a constant milk supply.

Chickens

Some Viliui Sakha households keep chickens for their daily egg production and because they require little space in a cage that fits into the upper area of the barn. Households with more layers than they need eggs for their immediate household can make quite lucrative business. One household kept ten layers and was able to sell two flats of 60 eggs a week. On an annual basis¹¹ this brought in 5,880 rubles (\$267 USD) or the equivalent of 4 months salary. There is also high demand for homegrown eggs as most people prefer them to store eggs, which are often a month old.

Pigs

Keeping pigs is highly labor intensive. One household in my sample kept pigs and the elderly mother seemed tied to the household *bania* where she daily stoked up the fire and cooked mash for the pigs made from cream of wheat, water and vegetable scraps. This took 3–4 h. Viliui Sakha pig-keeping households use their pigs as a form of currency and often generate a regular income from them. One household reported that they had a mother pig and five piglets and the mother was pregnant again. They either sell or barter the pig meat. For example, the previous year they slaughtered 7 pigs, ate one themselves, sold two and bartered the rest for gasoline, clothing, cow meat and butter.

¹¹Not including 10 weeks of non-laying.

The biggest obstacle to chicken and pig keeping is feed since both chickens and pigs require imported food. Although these imported foods were easily available in both my research villages during the state farm period this is no longer the case.

Gardening and Greenhouses

Vegetables remained a minimal part of Viliui Sakhas' diet up until the Soviet period, during which time there was an ample supply of fresh tomatoes, cucumbers, cabbage and fall crops grown and distributed by the local state farm. Since the dissolution of the state farm that production has halted and commercial access to fresh vegetables is hindered due to poor distribution and inflated prices. The only affordable way for households to have fresh or canned vegetables is to grow them and can them themselves.

The extreme climate of the Viliui regions and the hardships involved in bringing together the resources needed for successful gardening makes it an art. Growing your own vegetables requires time and skill. An average of 78% of all households in both research villages keep a greenhouse to grow cucumbers and tomatoes, to eat them fresh throughout the summer and/or can some for winter eating (Fig. 3a, b). Households that produce vegetables other than potatoes, cucumbers and tomatoes are rare. In the Elgeei village there are about ten such gardening households. The following description of two provides a window into what it takes to garden in the sub-arctic.

Two High Activity Gardening and Greenhouse Households

Sardana has four greenhouses and various garden beds. During my 2000 fieldwork year she kept a diary of her garden activities. Next door lives another accomplished gardener, Vara. She and her husband are dependent on their animal and garden product sales as the sole source of household income. Vara also recorded her gardening activity in detail for me. I used their data to create a horticultural calendar (Fig. 4).

To be successful gardeners, both Vara and Sardana have to have time, resources, and know-how. Vara learned the trade when she was one of the directors of the state farm greenhouse operation. She works full-time on her gardens and greenhouses. Sardana grew up in a family that kept gardens. She fits her gardening and greenhouse work into her free time when she is not working.

The most limited resource for households who have gardens and greenhouses is water. Both Vara and Sardana live on the riverbank. Several years ago they worked together to have a huge tank positioned on the high bank between their two houses and rigged up a pump to bring water up from the river when the tank was emptied. They both have a hose system running from the tank and in this way are able to keep enough water available for their gardens and greenhouses. Most households do not have such a set up and have to haul water. Soil is also an important resource. Most gardeners re-work their garden soil by incorporating manure. Sand is also a necessary addition due to the heavy soils. Changing the soil every few years is especially important for greenhouse production.

In sum, gardening and greenhouse production is largely a carry-over from the greenhouse and gardening practiced on the state farm level and now adapted to the household-level. It takes several key ingredients to produce vegetables for the household larder. A household needs the time to invest in gardens and greenhouses, the specific knowledge of how to work within the constraints of the subarctic growing season, the structures such as greenhouses and cold frames, the tools, the seeds, access to water and soil, and means to put up the harvest. Despite the high input to realize garden and greenhouse production, there has been an ever-increasing trend of households growing vegetables to supplement home food production.

Foraging

Berries are an important source of vitamins and minerals in the contemporary Sakha diet. From late June through the end of August most able-bodied women and children who do not need to be involved in hay cutting take to the woodlands and fields with their berry buckets (Fig. 5). Berry pickers often share the fruit and, more often, the jams with elder kin and neighbors who aren't able to harvest themselves. Many who are able-bodied don't pick all the berries through the season, because they are busy haying, tied to their house for childcare, or just not motivated to, but usually make the effort to pick *oton* (or cowberry, referred to in Alaska as low-bush cranberry *Vaccinium vitis idaea* and *Vaccinium vitis idaea* subsp. *Minus*), which begin ripening at the end of the major haying season and last to the first frost.



Fig. 5 A young boy berry picking with his buckets full of *oton* berries

There is a schedule of picking as the various berries come into seasons. The general season of berry foraging¹² begins in late June with *khaptaghas* or red currant (*Ribes rubrum atropurpureum*), followed by *jejen* or strawberry (*Fragaria vesca* and *F. elatior*), *malina* (Rus., red raspberry) (*Rubus idaeus*), *sugun* or blueberry (*Vaccinium uliginosum* and *Vaccinium uliginosum* subsp. *Microphyllum*), *monyoghon* or black currant (*Ribes nigrum* and *Ribes pauciflorum*), and culminating with *oton* (Malyshev 1997; Popov 1957).

In addition to berry foraging, many Viliui Sakha also gather *duluhwun* or rosehips (*Rosa acicularis* and *R. cinnamomea*), *luuk* or wild green onions (*Allium schoenoprasum*), *kiihilei*, or sorrel (*Rumex acetosa*), and *uray oto* or mugwort (*Artemisia vulgaris* L.). There has also been a rise in the collecting of medicinal plants. Elders know the herbs and their uses but it has only been in the last several years that I have witnessed widespread education about and harvesting of these herbs.

Hunting and fishing continue to be critical household food supplements in contemporary times especially when domestic meat stores are dwindling—from late spring until November. For some non-cow-keeping households, hunting and fishing often provide a main source of meat for the household.

¹²There are also some species that the more 'expert' berries forage for, including 'dog's paw,' 'crow berry,' and 'boney berry.'



Fig. 6 Fishing for *sobo* (crucian carp, *Carassius carassius*) in midwinter

Fish consumption is a common supplement in contemporary times because of convenience and availability. Sakha villages have always been located near a water source, either rivers or lakes. Fishing, and specifically for the lake fish, *sobo* (crucian carp, *Carassius carassius*), is the major focus of all hunting and fishing activities (Fig. 6). The main river fishing effort is in mid-winter and the main object, the spawning *sylyhar* or burbot (*Lota lota*). People fish through the ice with traps from December to February for spawning *sylyhar*, with a pole or stream catch net in the temperate months for *alyhar* or perch (*Perca fluviatilis*), *kustekh* or kirgiz dace (*Leuciscus leuciscus baicalensis*), *bil* or salmon trout (*Hucho taimen*) and *byiyt* or Siberian salmonid (*Brachymystax lenok*), or with a seine net for *tugunuk* or gudgeon (*Gobio gobio*).

There are two duck hunting seasons, in spring when the ducks fly through heading north to breed and in the fall on their return. The main duck species, include mallards (*Anas platyrhynchos*), the Eurasian wigeon (*Anas penelope*), the northern pintail (*Anas acuta*), the green-winged teal (*Anas crecca*), the Baikal teal (*Anas formosa*), the falcated duck (*Anas falcata*), the northern shoveler (*Anas clypeata*), the white-winger scoter (*Melanitta fusca*), the tufted duck (*Aythya fuligula*), the smew (*Mergus albellus*), the common eider (*Somateria mollissima*), the common pochard (*Althya ferrina*), the red-breasted merganser (*Mergus serrator*), and the common goldeneye (*Bucephala clangula*). During duck hunting season many hunters come home with birds other than ducks. Most common is the ruff (*Philomachus pugnax*). Less common and more highly prized than ruffs or any of the ducks are geese. The main species hunted are, the bean goose (*Anser fabalis*) and the greater white-fronted goose (*Anser albifrons*).

Contemporary Sakha largely hunt small game such as rabbits, wood birds and squirrels. The wood birds found include two species of capercaillies, the black-billed (*Tetrao*

urogalloides) and the western (*Tetrao urogallus*), the northern hazelhen (*Tetraster bonasia*), the northern black grouse (*Lururus tetrix*), the siberian spruce grouse (*Falcipennis falcipennis*), the willow ptarmigan (*Lagopus lagopus*) and the rock ptarmigan (*Lagopus mutus*). They can be found in the nearby woods requiring only a short trip on a motorcycle to hunt them. However, the hunting of larger game such as moose, bear and reindeer, requires travel into the taiga, far from any populated centers.

The Future of the Cows-and-kin Smallholder System

The cows-and-kin system is an ecologically and culturally resilient subsistence mode for contemporary rural Sakha. However there are at least three major challenges that put its future in question.

Households have to continually negotiate issues of land use and the related logistics of transportation to and from outlying areas to harvest and haul hay. They also are often lacking the necessary labor to cut, stack, and haul hay, largely due to the alienation and absence of youth. Lastly but perhaps most insurmountable, households confront increasingly unpredictable climate patterns that can render hay plots either too wet or too dry for production.

Accessing Land

In the post-Soviet context land continues to be state-owned and home food production is fraught with problems on the local level due to the insufficient leasing of state lands. Households are allotted a 1.5–2 ha hay area for which they pay a nominal rent annually. Smaller cooperatives, tasked with producing for consumption beyond subsistence, have 8+ hectare. Lastly, larger cooperatives have access to various land allocations for animal husbandry and agricultural production. Of all these systems, the household-level is most efficient and productive yet has to continuously negotiate and even battle for sufficient lands (Crate 2003b).

In addition, the proper and efficient accessing of lands once they are available is highly dependant upon knowledge of those lands (Crate 2002, 2006b). In the post-Soviet context there are some efforts to revive and use that knowledge in the local context but much more extensive efforts are needed to fully realize the power that knowledge could have to facilitate contemporary land use practices (Crate 2006d).

Alienated Youth

Youth, who should be moving into adult cow care and hay harvesting responsibilities for their household and extended kin, are not. In part this alienation is due to the effects of

globalization and modernity—as post-Soviet youth are increasingly privy to and influenced by the mass media and other forms of input from the outside world, they orient their goals to a global perspective beyond their small village. In part youth alienation is due to the lack of village-level youth employment. Although the majority of Viliui Sakha youth go on to higher education, employment and opportunity are found outside rural Viliui Sakha villages. Additionally, parents and relatives encourage youth to leave the village for the regional or capital centers where they can get a degree and find employment.

Youth who stay or decide to return to the village despite the lack of opportunity are jobless and often delinquent. Some village youth (predominantly female) help their parents maintain the family cow herd, while others (mostly male) tend to be delinquent and unengaged. Some youth stated that they want to live in the city or regional center because they consider the villages to be backward and unprogressive (Crate 2006c, d). They want a better education for their children and better living conditions, like hot and cold running water and paved streets.

Local Effects of Global Climate Change

It remains to be known how Sakha (and other native peoples with a direct dependence on their local environment) will rise to the complex challenges of the twenty-first century, specifically to global climate change which is bringing such rapid and unpredictable change. In 2004, in a survey of four villages for a community sustainability project, 90% of participants expressed their concern about local climate change—that it was causing unprecedented change in their local areas and that it threatens to undermine subsistence. They say they can't read the weather anymore, and that determines the success of harvesting enough fodder and foodstuffs to survive another long winter. The timing of the seasons has changed—that spring and fall come late. The climate has softened—winters are not as cold and summers not as hot—and that the heat now had a different quality—it is stifling with too much humidity. The weather changes very suddenly and without warning. New species are appearing from the south and that some old species were now gone. There is an overabundance of rain that comes at the wrong times—meaning no rain in the spring and too much during the hay cutting season.

These changes affect the harvesting of forage for animals. It also affects gardens which most rely on to supplement them through the long winter. It has become difficult for horses, which live outdoors year round and in winter depend on the right amount and quality of snow for their fodder. In recent years the snows come early then melt, forming an ice crust under the snow and making fodder inaccessible for horses. Hunting, a supplemental

source of food for many households, is similarly affected. Hay land is diminished by the inundation of water, making the harvest of sufficient animal fodder a challenge for most. Other lands are also affected.

Conclusion

Historically and today Viliui Sakha represent a stellar case of adaptation to an extreme subarctic climate, to colonization and Sovietization, and to the myriad of challenges in the post-Soviet context. Today a majority of rural Viliui Sakha have adapted to the loss of the Soviet-period centralized agro-industrial state farm system by developing a smallholder food production system relying on keeping cows among reciprocating kin households and supplementing with other subsistence sources including fish, game, forage, other domesticates and garden products. The cows-and-kin system represents an historically-based resilient smallholder adaptation based on reviving pre-Soviet production knowledge, recalling ecological knowledge and relying on pre-Soviet clan dependencies to pool the necessary resources.

Viliui Sakhas' resilient capacity to adapt is being tested in the early twenty-first century due to an alienated youth, issues of access to land, and the unpredictability brought about by the local effects of unprecedented global climate change. Of these, the challenge to system resilience takes on new meanings when exogenous forces that result in rapid changes, like that of climate change in the arctic, increasingly threaten tenacious human-environment systems. The implications of climate change for Viliui Sakha and other arctic subsistence-based peoples, highlight the need for much creative innovation on the part of those peoples if they are to continue their reliance on local lands and resources.

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