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Food Yields and Nutrient Analyses of the Three Sisters: A Haudenosaunee Cropping System

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Abstract Scholars have studied the Three Sisters, a traditional cropping system of the Haudenosaunee (Iroquois), from multiple perspectives. However, there is no research examining food yields, defined as the quantities of energy and protein produced per unit land area, from the cropping system within Iroquoia. This article compares food yields and other nutrient contributions from the Three Sisters, comprised of interplanted maize, bean and pumpkin, with monocultures of these same crops. The Three Sisters yields more energy (12.25 x 106 kcal/ha) and more protein (349 kg/ha) than any of the crop monocultures or mixtures of monocultures planted to the same area. The Three Sisters supplies 13.42 people/ha/yr. with energy and 15.86 people/ha/yr. with protein. Nutrient contents of the crops are further enhanced by nixtamalization, a traditional processing technique where maize is cooked in a high alkaline solution. This process increases calcium, protein quality, and niacin in maize.

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Introduction

Intercropped maize (*Zea mays*), bean (*Phaseolus* sp.), and squash (*Cucurbita pepo*), commonly called the Three Sisters, is a traditional agricultural system of the Haudenosaunee (Iroquois). Fenton and Trigger (1978:299) called it the "foundation of (Iroquois) subsistence," which enabled Iroquois communities "to develop the institutions of sedentary life." Contemporary Haudenosaunee scholars however view the cropping system as having significance far greater than subsistence. Cornelius (1999:91) identifies "Corn as a cultural center of Haudenosaunee way of life." She describes the ways in which corn, bean, and squash appear in ceremonies and oral texts, integrating natural cycles with Haudenosaunee cultural traditions. Researchers from multiple fields have examined its origins, history, socio-cultural aspects, agronomic characteristics, and agricultural productivity (Hart 2003, 2008; Lewandowski 1987; Mt.Pleasant 2006, 2011; Mt.Pleasant and Burt 2010; Parker 1910; Sauer 1952). None, however, have examined the Three Sisters for its food yield, which I define as quantities of energy and protein produced per unit area of land. In this article I address the following questions: how much edible food, in terms of energy and protein, would Haudenosaunee farmers have harvested from their fields, and to what extent would these plants have satisfied the nutritional requirements of their communities? Would planting these three crops as monocultures, rather than a polyculture, affect their ability to satisfy food needs?

The Three Sisters: A Brief History

Carl Sauer (1952:64) described the Three Sisters as "a symbiotic plant complex of North and Central America without an equal elsewhere." The three crops, whether grown individually or as a polyculture have a very long history across the Americas (Hurt 1987; Landon 2008; Sauer 1971). My focus here, however, is their cultivation in northeast North America. When Europeans began to colonize North America, records from the sixteenth century describe an immensely productive agriculture based on maize, bean, and squash established from Florida to Ontario (Sauer 1971). Haudenosaunee agriculture was one of the first indigenous cropping systems reported by Europeans. Cartier (1993) in his voyages up the St. Lawrence in 1534–1535 detailed the cultivation of the

Three Sisters in fields near present-day Montreal. Scholars believed until recently that the three crops, maize, bean, and pumpkin, arrived in the northeast as an intact cropping system sometime around 1000–1200 BP (Ritchie 1973, 1980). More recent work by paleobotanist John Hart (2003, 2007, 2008) has identified a very different history. According to Hart (2008), edible squash appeared first in the northeast at the end of the third millennium BP, while maize was present in New York by 2270 +/- 35 BP. Bean, however, did not arrive until late in the prehistoric period. Hart (2008) concludes that the three crops were not grown as polyculture by the Iroquois until after 700 BP.

Arthur Parker (1910) provided the first academic description of the cropping system in his work entitled *Iroquois Uses of Maize and Other Food Plants*. Relying primarily on information from Haudenosaunee living in Seneca and Onondaga communities, Parker described many of the social and cultural aspects of the crops and the agricultural practices used to grow them as a polyculture. Parker (1910:91–92) reported that the Iroquois preferred to plant the three crops as a polyculture because it required less time and labor than planting the crops individually and because they believed the plants were "guarded by three inseparable spirits and would not thrive apart." Parker (1910) and Waugh (1916) described more than a dozen varieties of maize and similar numbers of bean varieties (*Phaseolus vulgaris*), as well many types of *Curcurbita pepo,* including pumpkin, winter squash, melon, and cucumber grown in Haudenosaunee communities.

Stephen Lewandowski (1987) provided a thorough agronomic explanation of the cropping system, as well as a detailed description of its cultural and social context within Seneca communities. My own work has focused on the agricultural productivity of the Three Sisters and the ways in which the system addresses issues of sustainability (Mt.Pleasant 2006, 2011; Mt.Pleasant and Burt 2010).

As a cropping system, the Three Sisters has two major components: 1) intercropped maize, bean, and squash; and 2) the use of mounds where the crops are planted. Both components have significant effects in terms of productivity and sustainability (Mt.Pleasant 2006). Each crop serves an important function; their integration into a single cropping system takes advantage of their differing and complementary growth habits, plant architectures, agronomic characteristics, and food values. These crops were planted in fields that were not plowed. The lack of tillage enhanced the sustainability of the cropping system as it dramatically decreased oxidation of soil organic matter and soil erosion, which preserved soil fertility (Mt.Pleasant 2011, 2015).

Research by Mt.Pleasant and Burt (2010) found that maize yields were not affected by the presence of bean and pumpkin, yielding as well in the polyculture as in monoculture. However, bean and squash yields were greatly reduced when grown with maize compared to their yields in monocultures. They surmised that Iroquois farmers would have grown their crops as a polyculture if they were primarily focused on maize production, but shifting priorities might lead them to grow any of these crops as monocultures. The Iroquois also frequently traded their crops, so the need for each crop could vary substantially from year to year, depending not only on community's domestic needs but also its external trade. This suggests that the Iroquois may have typically inter-planted the three crops, but they could also have planted monocultures of the individual crops to meet specific needs.

Nutritional Characteristics of Maize, Bean, and Squash

Six major classes of nutrients are used to determine the overall nutritive value of foods: carbohydrates, fats, protein, vitamins, minerals, and water (Otten et al. 2006). The main sources of energy, measured as kilocalories, are carbohydrate, fat, and protein. Vitamins and minerals assist in the body's metabolism of carbohydrate, fat and protein. In assessing the

Table 1 Energy, protein, and water contents of maize, bean, and pumpkin.

Crop	Energy (kcal/kg)	Protein (g/kg)	Water (g/kg)
Maize	3650	94	100
Bean	3370	225	120
Pumpkin Flesh	260	10	26
Pumpkin Seed	5590	302	5

Note: Data from the USDA National Nutrient Database (USDA NND 2016).

Table 2 Energy, protein, and water contents of maize, bean, and pumpkin.

Amino Acid	Maize[1]	Bean[2]	Pumpkin Flesh[3]	Pumpkin Seed[4]
Histidine	0.17	0.17	0.001	0.23
Isoleucine	0.26	0.38	0.002	0.17
Leucine	0.76	0.78	0.003	0.38
Lysine	0.19	0.41	0.003	0.32
Methionine	0.12	0.07	0.001	0.08
Phenylalanine	0.23	0.36	0.002	0.25
Threonine	0.19	0.27	0.002	0.17
Tryptophan	0.03	0.08	0.001	0.10
Valine	0.28	0.28	0.002	0.21

[1]Maize values from Bressani 1958.
[2]Bean values from Wagh 1963.
[3]Pumpkin flesh values calculated from data provided in USDA National Nutrient Database (USDA NND 2016).
[4]Pumpkin seed values from Mansour 1993.

Three Sisters for their nutritional contributions, I focus on energy and protein. Food must supply sufficient energy for daily activities; once the energy requirement is satisfied, protein is used to provide amino acids, which are essential for cell and organ functions that affect many physiological processes in the body (Otten et al. 2006). Calcium, carotene, as the precursor to vitamin A, and niacin play important roles in the Three Sisters, and I include them in my assessment.

Most subsistence farmers rely on a cereal grain (wheat, rice, or maize), combined with a legume (bean, lentil, or pea), to provide the majority of their dietary needs. Cereal grains such as maize are valuable because they produce large amounts of energy and modest amounts of protein (Table 1). Maize grain is easily transported and stored for long periods of time. Bean typically yields much less than maize, but contains more than twice the protein (Table 1). The amounts and proportions of essential amino acids determine protein quality. Cereal grains and legumes are often referred to as incomplete proteins because neither has all nine amino acids essential for human diets (Ronzio 2003). Maize lacks lysine and tryptophan, but has sufficient methionine. In contrast, bean has little methionine, but contains higher levels of lysine (Table 2). By mixing maize and bean, protein quality can be increased. According to the Food and Agriculture Organization (FAO) (1992) a ratio of 70% maize to 30% bean provides the appropriate mix of amino acids for a complete protein.

Although the Haudenosaunee grew many types of cucurbits, winter squash (or pumpkin) is the most nutrient dense and is the focus in this discussion. I use 'squash' and 'pumpkin' interchangeably to refer to types whose fruits are relatively large, with firm orange or yellow flesh and thick rinds. Pumpkin makes a substantial nutritional contribution. Its flesh contains some calories and large amounts of Vitamin A, while its seeds are very rich in both energy and protein. Surprisingly, pumpkin flesh also contains protein, although much less than either maize or bean (Table 1). Similar to maize and bean, pumpkin protein is incomplete, but its amino acids can complement those in maize and bean to form a high-quality protein.

The food values of maize and bean depend on when they are harvested. Both crops can be eaten in the immature state, as sweet corn and green beans. Harvesting these crops when they are immature, however, sacrifices significant food value (Table 3). Green beans contain very little energy or protein, but when harvested as mature dry beans, they become protein and energy powerhouses, with more than 100 times the energy and eight times the protein. When people eat green beans, they consume the pod, composed primarily of water and cellulose; the enclosed seeds are so small that they provide little nutrition. However, when the beans are fully mature and eaten as dried beans, the dried pod is discarded and only the mature seed is consumed with its rich store of energy and protein.

Regardless of when maize is harvested, people consume the seed (more accurately the kernel). If harvested immature, the kernel consists mostly of water because translocation of carbohydrates and protein to the kernel is incomplete. Its nutritional value is modest compared to mature maize kernels, which contain more than 40 times the energy and three times the protein as sweet corn. When maize and bean are picked green, most of the harvest is water; when fully mature, their water content plummets and food content increases dramatically (Table 3).

Whole squash can be stored for many months in cold weather; it can also be sliced and dried for even longer storage. There is almost no mention in the historical record of the Haudenosaunee eating the seeds of squash. Neither Parker (1910) nor Waugh (1916) includes squash seeds in their monographs on Iroquois foods. But it's hard to imagine that the Haudenosaunee would have ignored or discarded such a rich food source. The Haudenosaunee did consume sunflower seeds, and given the similarities in size and texture, perhaps some references to sunflower seeds were in fact pumpkin seeds (Parker 1911; Waugh 1916). For this reason, I include the nutritional contributions from pumpkin seed here.

Methods

The term food yield in this article refers to the amounts of energy or protein produced by crops grown on a specific area of land. It is calculated by multiplying the crop yield (kg/ha) at given moisture content by the amounts of energy and protein contained per kg crop at the same moisture content. In the US, maize and dried bean yields are typically reported at 15% and 12% moisture respectively. Pumpkin yields however, are usually reported as fresh weights at harvest, which typically range from 90 to 95% moisture. The first step to determine food yield is to obtain the crop yield, given in kg/hectare, noting the water content at which the yield is reported. I obtained crop yields from previously published research (Mt.Pleasant and Burt 2010), which provides estimates of maize, bean, and pumpkin yields obtained by Haudenosaunee farmers in the seventeenth and eighteenth centuries. The article gives yield information for the crops planted as a polyculture and as monocultures from field research at two sites in New York over a three-year period.

Parts of the harvested crop yield cannot be eaten and must be subtracted before food yield is measured. Maize kernels and bean seeds are almost completely edible; neither has husks or shells that are discarded before the crops are eaten. However, a significant portion of harvested pumpkin is rind and stem, which are not edible. Pumpkin also consists of two foods, flesh and seeds, with very different nutrient profiles. Consequently, these components must be evaluated separately. In the field experiments reported above, only weights of whole pumpkin were reported. To determine the amounts of pumpkin seeds contained within the whole pumpkin I used figures derived from the literature. In an experiment that examined weight of whole pumpkins and seed weight for nine pumpkin varieties (*Cucurbita pepo*), researchers found that one kg pumpkin (fresh field weight) yielded 13 grams dry seed (Walters 2006). Using this ratio, I calculated amounts of dry pumpkin seed from the pumpkin yields in the data set. The USDA National Nutrient Database estimates edible pumpkin flesh as 70% of the whole fresh pumpkin with the remainder being seeds, rind, and stem. I reduced the field weight of whole pumpkins by this amount to determine pumpkin flesh.

Table 4 provides crop yields in the Three Sisters and monoculture cropping systems, adjusted as described above. Energy and protein contents of each food were obtained from the USDA National Nutrient Database and are found in Table 1. When pumpkin flesh is part of a diet that includes maize, bean, and pumpkin seeds, the small amounts of amino acids in its flesh can complement those in other foods to provide higher quality protein. Thus, I include the

Table 3 Water, energy, and protein contained in maize and bean in immature and mature states. Values are for uncooked foods.

Crop	Food	Water (g/100g)	Energy (kcal/kg)	Protein (g/100g)
Maize	Sweet Corn	76	86	3
	Corn Grain	10	3650	9
Bean	Green Bean	90	31	2
	Kidney Bean	12	3370	30

Note: Data from the USDA National Nutrient Database (USDA NND 2016).

Table 4 Maize, bean, pumpkin flesh, and pumpkin seed yields (kg/ha) from Three Sisters and monoculture cropping systems, adapted from Mt.Pleasant and Burt 2010. Pumpkin flesh and pumpkin seed yields modified as described in the text.

Cropping System	Maize[1]	Bean[1]	Pumpkin Flesh[2]	Pumpkin Seed[3]
Three Sisters	2933	74	3513	68
Monoculture	3258	786	13612	266

[1]Maize and bean yields contain 10% moisture.
[2]Pumpkin flesh contains 90% moisture.
[3]Pumpkin seeds contain 5% moisture.

protein in pumpkin flesh in determining the amount of protein available in the Three Sisters and monocultures of the three crops. Food yields in the Three Sisters polyculture and in crop monocultures were then calculated by multiplying each crop yield by its energy and protein content. This provides comparisons of food yields between monocultures of each crop and the Three Sisters.

However, comparing food yields of the Three Sisters with those from each crop's monoculture is not useful. Haudenosaunee farmers would not have chosen between planting the Three Sisters and, for example, planting the entire field to bean monoculture. If they did not plant the three crops as a polyculture, they would likely have planted all three crops as monocultures in smaller areas of the same field, or in smaller separate fields. To capture more relevant comparisons, I calculated the food yields of what I call *monoculture mixtures* to distinguish them from a single crop monoculture planted on the entire field. For example, I compare food yields from one hectare of the Three Sisters to a monoculture mixture comprised of monoculture maize, monoculture bean, and monoculture pumpkin, each occupying 1/3 hectare. Varying the portions of each crop within the monoculture mixture provides more information about how energy and protein yields vary in these systems, compared to the Three Sisters. I calculated

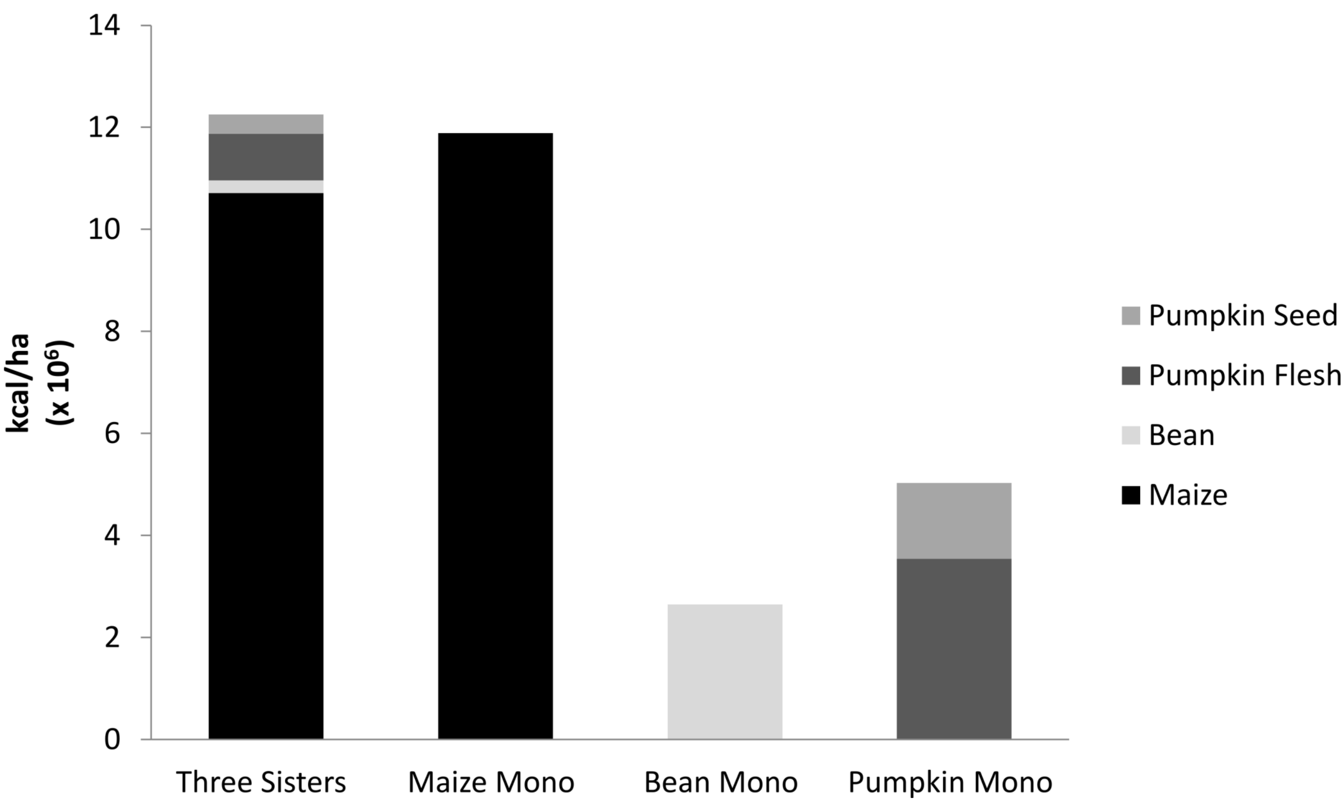

Figure 1 Energy yields (kcal/ha) of Three Sisters and monocultures of maize, bean, and pumpkin.

food yields for four monocultures mixtures with varying percentages of maize, bean, and pumpkin monocultures: 1) 33% maize, 33% bean, 33% pumpkin (33/33/33); 2) 50% maize, 25% bean, 25% pumpkin (50/25/25); 3) 80% maize, 10% bean, 10% pumpkin (80/10/10); and 4) 100% maize (100/0/0).

To determine how many people could be supported by the food yields from each cropping system, I assumed an active adult needs 2500 kcalories/day and 60 grams protein/day (Otten et al 2006). On a yearly basis, each adult would require 912,500 kcal and 22 kg of protein.

Results

Energy and Protein

Figures 1 and 2 show energy and protein yields for the Three Sisters and for monocultures of maize, bean and pumpkin. The Three Sisters produced two to four times more energy than monocultures of bean and pumpkin, but only slightly more energy than maize monoculture (Figure 1). The Three Sisters also produced more protein than the monocultures, with maize monoculture in second place (Figure 2.) Bean monoculture contained only 175kg/ha protein, but it also yielded much less: 800 kg/ha bean compared to more than 3000 kg/ha maize (Table 3). Figures 3 and 4 show energy and protein yields in the Three Sisters compared to four monoculture mixtures. The Three Sisters produced more energy (12.25 x 10^6 kcal/ha) and more protein (349 kg/ha) than any of the monoculture mixtures. Across the monoculture mixtures, energy and protein increased as the percentage of maize increased.

People Supported

The Three Sisters provides energy for 13.42 people/ha and protein for 15.86 people/ha, more than any of the monocultures or monoculture mixtures (Figure 5). Maize monoculture is similar, with energy for 13.03 people/ha and protein for 14.05/ha. In contrast, the other monoculture mixtures support many fewer people, ranging from 7.15 to 11.25 people/ha for energy and 10.64 to 13.05 people/ha for protein (Figure 5).

Discussion

The energy production from maize reflects the nutrient density of its grain, which is further magnified by its large crop yield compared to bean and pumpkin.

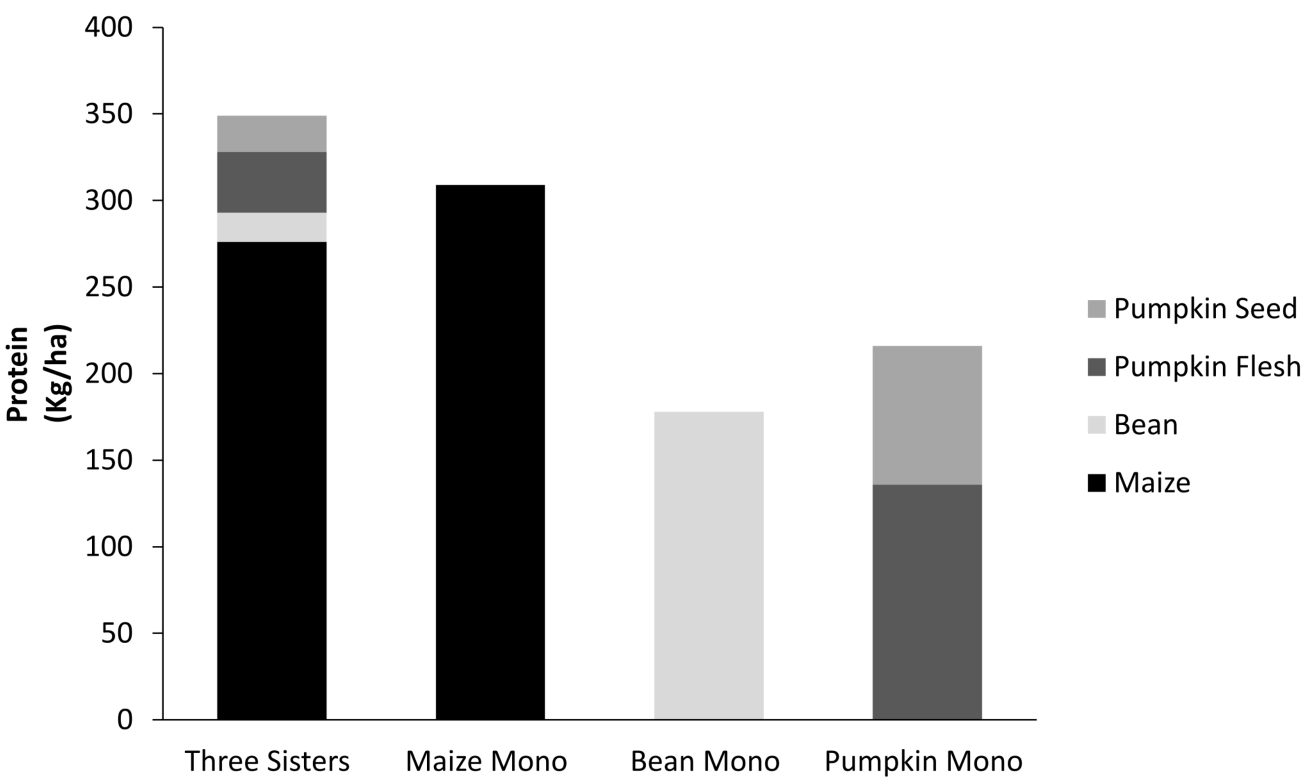

Figure 2 Protein yields (kg/ha) of Three Sisters and monocultures of maize, bean, and pumpkin.

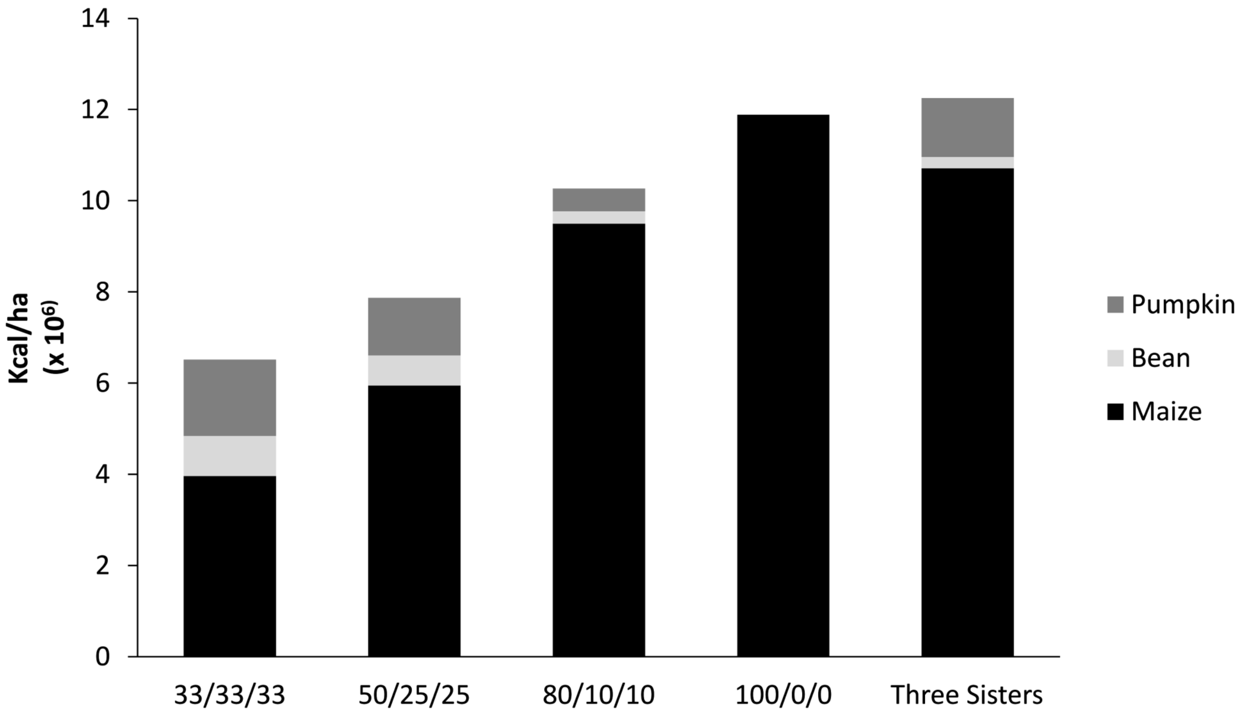

Figure 3 Energy yields (kcal x 10^{6}/ha) from monoculture mixtures compared to Three Sisters. First number in monoculture mixture is percent area planted with maize; second number is percent planted with bean, and third number is percent planted with pumpkin.

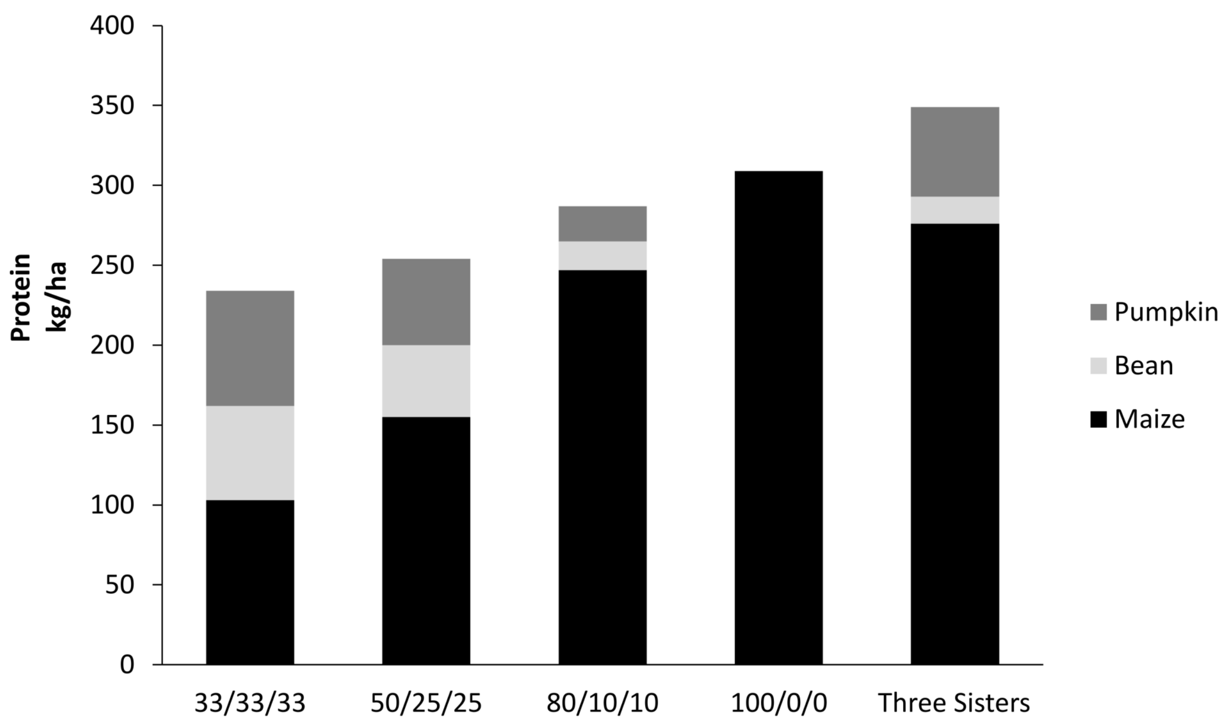

Figure 4 Protein yields (kg/ha) by monoculture mixtures compared to Three Sisters. First number in monoculture mixture is percent area planted with maize; second number is percent planted with bean, and third number is percent planted with pumpkin.

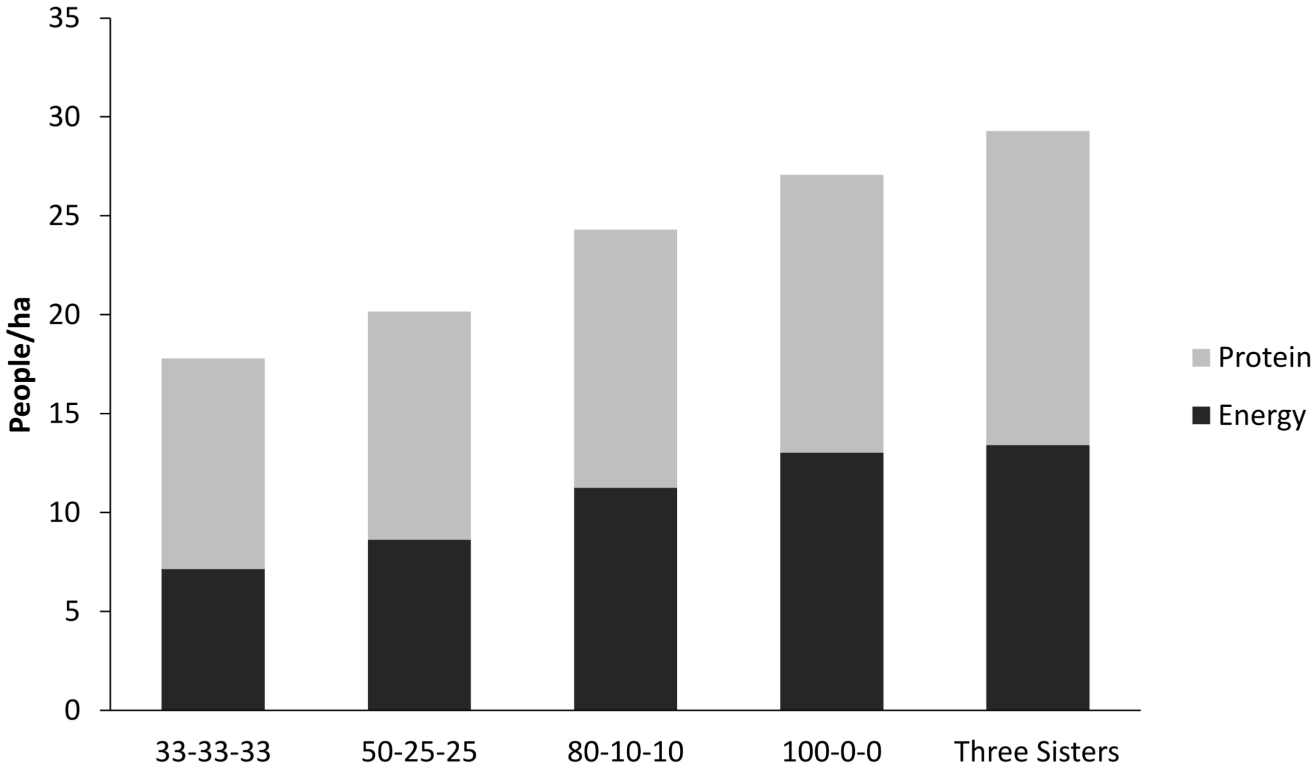

Figure 5 Number of adults supplied annually with energy and protein from monoculture mixtures compared to the Three Sisters. First number in monoculture mixture is percent area planted with maize; second number is percent planted with bean; and third number is percent planted with pumpkin.

Even though maize yields were slightly higher when grown in monoculture compared to the Three Sisters, additional energy from bean and pumpkin in Three Sisters compensated for the slightly lower maize energy in this cropping system. Although the protein content of maize is modest, the large quantity of maize crop yield results in substantial food yield of protein. In the monoculture mixtures, energy and protein increased as the percentage of the field planted to maize increased. This demonstrates why many subsistence farmers plant maize as the foundation of their agricultural systems. Maize, whether grown as a polyculture or monoculture, yields enormous amounts of energy and significant amounts of protein. In the Three Sisters, the protein from maize is further enhanced by protein contributions from bean and pumpkin. With the Three Sisters, farmers harvest about the same amount of energy as from maize monoculture, but they get significantly more protein yield from the inter-planted bean and pumpkin. This single result largely explains the value of the Three Sisters over monoculture mixtures; the system yields large amounts of energy and at the same time increases protein yields.

Although bean yields less compared to maize, it contains more than twice the amount of protein in every unit (Table 1). This implies that subsistence farmers will grow bean, in spite of the lower yield, because of its high protein content. Surprisingly, pumpkin monoculture supplies more protein than bean monoculture, largely because of the contribution of pumpkin seeds. Pumpkin seeds contain significant amounts of essential amino acids while its flesh has very small amounts (Table 2).

A diet based on maize, bean, and pumpkin can meet peoples' basic energy and protein requirements. However, I was also interested in assessing the extent to which these foods could supply some of the vitamins and minerals necessary for human health. Pumpkin flesh is one of the richest sources of Vitamin A; people regularly consuming even modest amounts of it would likely never be deficient in this important vitamin (Table 5). Bean and pumpkin seed contain more calcium than maize or pumpkin flesh, but

Table 5 Calcium, Vitamin A, Vitamin C, and niacin in maize, bean, pumpkin flesh, and pumpkin seed.

Crop	Calcium (mg/100g)	Vitamin A (IU/100g)	Vitamin C (mg/100g)	Niacin (mg/100g)
Maize	7	0	0.0	3.63
Bean	83	0	4.5	2.11
Pumpkin Flesh	21	8513	9.0	0.60
Pumpkin Seed	46	15	1.9	4.99
RDA[1]	1000	5000	60.0	15.00

[1]Recommended Daily Allowance. Data from USDA Dietary Reference Intakes (USDA DRI 2016).

amounts of this mineral still appear to be insufficient. However, the calcium story is complex because it involves more than the nutritional content of the foods themselves.

Maize contains very small amounts of calcium and niacin (Table 5), but processing and cooking greatly impacts these two nutrients. Raw maize kernels are largely inedible for people. They must first be cooked before they can be consumed. Many indigenous peoples in the Western hemisphere, particularly in North America, prepared maize using a process called nixtamalization in which the kernels were soaked and/or cooked in an alkaline solution (Blake 2015; Coe 1994; Katz 1975). In Central America maize was first boiled with lime or lye, and then ground and formed into flat breads or tortillas, which were then cooked on a hot stone (Briggs 2015). In eastern North America, and particularly within Iroquoia, maize was frequently cooked with ashes from hardwood trees (Briggs 2015; Katz 1974; Parker 1910). Hardwood ashes contain large quantities of calcium and potassium, producing an alkaline solution similar to that from lime and lye.

Maize kernels with their very hard seed coats require hours of cooking before they are soft enough to chew easily. Nixtamalization involves both heat and alkaline conditions that alter the kernels' physical and chemical characteristics (Trejo-González 1982). First, the high pH solution hydrolyses cell walls of the pericarp, enabling its removal, which greatly reduces the cooking time needed to soften the kernel (Gomez 1989). Consequently, maize boiled in water with wood ash cooks much more quickly than maize cooked in water alone. The alkaline solution also causes chemical changes. Calcium is a basic cation with a positive charge. After the maize pericarp is removed, the calcium cations are attracted to and held by the starch grains. Thus, the calcium content of nixtamalized maize has 2 to 4 times more calcium than uncooked maize (Trejo-González 1982). The calcium available in nixtamalized maize, combined with that from bean and squash, would likely provide the minimum daily requirement for this mineral.

Both heat and the alkaline solution also affect proteins and amino acids within maize. The principal protein in maize is prolamin zein, which makes up more than 50% of its total protein. Zein proteins are deficient in lysine and tryptophan, making them less valuable nutritionally (Katz 1974). Heat and the nixtamalizing solution decrease the solubility of zein proteins; at the same time nixtamalization increases relative amounts of lysine, tryptophan, histidine, methionine, and threonine. Thus, compared to uncooked maize, nixtamalized maize has lower total protein, but it contains more essential amino acids, especially lysine, which greatly improves the quality of its protein and its nutritional value (Bressani 1958; Katz 1974; Trejo-González 1982).

Maize is also deficient in niacin, a B Vitamin. Tryptophan is a precursor to niacin; thus the shortage of niacin in maize is also linked to its lack of tryptophan (FAO 1992; Katz 1974). Niacin deficiency causes pellagra, a disease associated with people whose diet consists primarily of maize, with no other protein-rich foods (Blake 2015; Briggs 2015; FAO 1992; Fussell 1999; Katz 1974; Roe 1973). Nixtamalization increases available niacin in maize and also increases tryptophan, which allows more niacin to be formed. Pellagra was widespread in many areas of Europe in the eighteenth and nineteenth centuries, in the southeastern US in the early twentieth century, and still occurs today in poor populations of Africa, Asia, and Latin America (FAO 1992; Rajakumar 2000; Roe 1973). However, there is no evidence that it occurred among indigenous populations in the western hemisphere before colonization (Fussell 1999; Roe 1973). Pellagra was absent in these populations because they consumed maize primarily in nixtamalized form. They also supplemented maize with bean, which contain tryptophan, as do pumpkin seeds.

Even without nixtamalization, people who eat bean (and pumpkin seeds) with their maize consume high-quality protein and sufficient niacin to prevent pellagra.

Conclusions

Intercropping maize, bean, and pumpkin provided a highly productive cropping system that largely satisfied the dietary needs of Haudenosaunee communities. The anchor of the system, maize, is unique among cereal grains with its tall, robust plant architecture that produces large quantities of nutrient-dense grain. Whether planted alone or with other crops, maize yields enormous amounts of energy and modest levels of protein. Nixtamalization, cooking maize in an alkaline solution, further enhances maize's nutrient profile by increasing calcium and niacin and improving the quality of its protein. Haudenosaunee farmers took advantage of these characteristics by adding bean and pumpkin to their maize fields. Bean and pumpkin seeds increased protein yield while pumpkin flesh provided large amounts of Vitamin A. This polyculture cropping system yielded more food and supported more people per hectare compared to monocultures of the individual crops or monoculture mixtures.

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Conflicts of Interest: None declared.

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