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Challenges in the supply and consumption of wild berries in Finland

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ABSTRACT

The purpose of this paper is to explore the supply and consumption of wild berries in Finland and their challenges. Theoretical framework comprises the description of supply chain of wild berries, and wild berries as a source of nutrition in Finland. Secondary data comprises official statistics, previous research, and newspaper articles. Foreign berry pickers are an important resource from the viewpoint of picked quantities. The main challenge is how to increase the number of both domestic and foreign pickers. The findings increase the understanding of wild berries as an important natural resource and raw materials for different industries and exports.

Keywords: Consumption; natural resource; picking; supply chain; wild berries

1 Introduction

Picking wild berries in Finland has become an increasingly complex international phenomenon since 2005. It is related to many aspects, for example, right to utilize natural resources in the form of “everyman’s right” vs. organized commercial activities; foreign berry pickers; visa policy; income and payment policy; reimbursing the losses for berry pickers from Thailand; human trafficking; employer vs. entrepreneur; legislation related to working time; human nutrition; raw materials in food, pharmaceutical and cosmetics industries; and imports and exports among others.

Wild berries are valuable natural resources from the viewpoint of nutrition and as raw materials in various sectors of food industry. About 50 different kinds of wild berries grow in Finland, and 37 of them are edible (Roininen and Morkkila, 2007). The most important wild berries are bilberry (*Vaccinium myrtillus*), lingonberry (*Vaccinium vitis-idaea*), and cloudberry (*Rubus chamaemorus*). Other wild berries are bog bilberry (*Northern bilberry*) (*Vaccinium uliginosum*), arctic raspberry (*Rubus arcticus*), crowberry (*Empetrum nigrum*), cranberry (*Vaccinium oxycoccos*, *V. microcarpum*), serviceberry (*Amelanchier*), arctic bramble (*Rubus arcticus*), rowanberry (*Sorbus aucuparia*), raspberry (*Rubus idaeus*), and sea buckthorn berry (*Hippophaë rhamnoides*). However, with large forest areas and marshes, wild berries are not yet picked and utilized in the maximum amount. The reasons for that are, for example, low number of berry pickers; low motivation of the younger generations to pick wild berries; and low appreciation of wild berries as a source of income. Moreover, wild berries are located in the regions (Eastern and Northern Finland) with low population density and the concentration of population in towns. However, in Finland everyone has “public right of access” i.e. “everyman’s right” to pick wild berries everywhere, except not too close to people’s home and estates. In addition, the income from the sales of wild berries is tax-exempt for the berry pickers (Maaseutuvirasto, 2013, p. 5).

The research questions read as follows:

- What have been the yield estimates of wild berries during 2006 - 2012?
- What have been the quantities of wild berries supplied for sale during 2006 – 2012?
- What have been the price levels paid for the berry pickers?
- What has been the number of foreign berry pickers and where do they come from?

- Who are the actors in the supply chain of wild berries from the forest areas and marshes to consumption in Finland?
- What kinds of challenges emerge with respect to supply and consumption of wild berries in Finland?

The research design is both descriptive and explorative. The research is limited in wild berries, not grown berries.

2 Theoretical framework

2.1 Supply chain of wild berries

Christopher (2011, p. 4; Aitken, 1998) defined supply chain as follows: “A network connected and interdependent organisations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users.” Moreover, Christopher (2011, p. 11) defined logistics as follows: “The scope of logistics spans the organisation, from the management of raw materials through to the delivery of the final product”. The logistics management process composes of suppliers, procurement, operations, distribution, and customers. Those two definitions are applicable in the context of an industrial firm receiving orders from customers and delivering them. In the context of wild berries that ripen in summertime in the forests; their annual yield is varying; and they have to be picked; the supply chain include also other actors.

Levén and Segerstedt (2004) presented a figure of material and production flow of wild berries. The supply chain of wild berries includes forest, where the persons pick the berries. Subsequently, the pickers transport and sell the berries to the buyer, who is a private entrepreneur and an agent for the berry company. The berry company organizes the transports of the berries to the freezing facility. After freezing, the frozen berries are further processed; i.e. scrap and low quality berries are sorted out automatically. After that, the berries are packed and stored and later delivered to the customer. (Levén and Segerstedt, 2004)

2.2 Wild berries as a source of nutrition

Wild berries are nutritionally valuable natural resources. In rural areas in Finland, wild berries have been an important source of nutrition offering vitamins during the tens of decades ago. However, since 1970's, when the migration from rural areas into towns started and the number of people in rural areas decreased, the importance of wild berries has decreased as a source of daily nutrition.

Finnish wild berries are rich with respect to nutrition content, and they are good sources of vitamins, trace elements, and fibre. Other agents are phenol compounds and polyphenols. The main phenol groups are flavonoids, phenol acids, lignans, and phenol polymers (tannins). (Roininen and Mokka, 2007) According to the new Nordic nutrition recommendations (Valtion ravitsemusneuvottelukunta, 2013; Norden, 2013), for adults, "a suitable target is >3 g/MJ from natural fibre-rich foods such as vegetables, whole grains, fruits and berries, pulses, and nuts and seeds." The Finnish nutrition recommendations (Valtion ravitsemusneuvottelukunta, 2014) recommend that root vegetables, other vegetables, berries and fruits, and mushrooms should be eaten at least 500 g in a day, i.e. about 5 - 6 portions. This amount should include a half of berries and fruits and the rest half root vegetables and other vegetables. One portion includes e.g. one dl berries.

Wild berries are a substitute product for fruits (Kangas, 2001). Substitution was slightly clearer among berry pickers compared to berry buyers. A total of 45 per cent of berry picking households reported that wild berries replaced fruits either to a considerable extent or very much, while for berry buyers the corresponding figure was 30 per cent. (Kangas, 2001)

2.3 Previous research on wild berries

Previous research on wild berries from nutritional point of view has concentrated on flavonoid and antioxidants (cf. Borges et al., 2010); and polyphenols (cf. Riihinen et al., 2008; Hokkanen et al., 2009). Yield of berries was explored by Ihalainen et al. (2002; 2003). Pouta et al. (2004) explored recreational wild berry picking in Finland; and Häkkinen et al. (2000) and Koponen et al. (2008) focused on processing. Trade of main wild berries in Finland was explored by Kangas (1999); wild berry utilisation and markets in Finland by Kangas (2001); the use of wild berries in cuisine by Sillanpää (2005); voice of the Nordic wild berry industry

Paasilta et al. (2009); and the storage capacity and location of inventory by Levén and Segerstedt (2004).

3 Statistics of wild berries

3.1 Yield estimates, supplies for sale, income for pickers

Annual yield estimates of bilberries, lingonberries, and cloudberry are based on Metla's (The Finnish Forest Research Institute) annual estimates of each year's yield (Table 1).

Year	Bilberry (<i>Vaccinium myrtillus</i>)	Lingonberry (<i>Vaccinium vitis-idaea</i>)	Cloudberry (<i>Rubus chamaemorus</i>)
2006	From weak to middling yield	Below middling yield	Middling yield
2007	Middling yield	From middling to substantial yield	Middling yield
2008	From weak to middling yield	Middling yield	Middling yield
2009	Middling yield	Middling yield	Weak yield
2010	From weak to middling yield	From middling to substantial yield	Weak yield
2011	From middling to substantial yield	From weak to substantial yield	Weak yield
2012	From weak to substantial yield	Substantial yield	From weak to middling yield
Range of annual yield	150 – 250 mill. kg	100 – 500 mill. kg	25 – 30 mill. kg

Table 1. Yield estimates of bilberries, lingonberries, and cloudberry (Metla, 2013b; Roininen and Mokka, 2007).

The annual yields of wild berries are about 500 – 1000 mill kg, and only 40 – 45 mill. kg are picked. The households pick about 30 mill. kg for their own use and the industry receives only about 12 – 15 mill. kg. The rest about 100 mill. kg could be picked. (Roininen and Mokka, 2007, p. 12) Only about 3 – 10 per cent of lingonberry and bilberry yields, and about 20 per cent of cloudberry yield is picked (Roininen and Mokka, 2007).

Luonnonvarainneuvosto's (2009) annual yield estimate is about 500 mill. kg. The quantities of wild berries supplied for sale are introduced in Table 2.

Year Berry	2006 1000 kg	2007 1000 kg	2008 1000 kg	2009 1000 kg	2010 1000 kg	2011 1000 kg	2012 1000 kg
Bilberry	3 339,3	4 928,3	1 746,6	3 015,4	2 779,9	3 102,4	6 816,8
Lingonberry	2 437,6	5 887,4	4 041,3	3 678,3	6 057,2	8 528,8	8 667,8
Cloudberry	211,1	37,2	169,9	73,8	152,1	100,4	112,0
Rowanberry	52,2	0	18,0	6,1	0	0	0,1
Crowberry	0,3	422,0	2,3	32,9	98,4	...	44,1
Cranberry	17,7	22,6	6,7	11,0	8,8	32,4	9,2
Arctic bramble	0,9	0,4	0,8	0,9	0,3	1,1	0,9
Sea buckthorn berry	5,9	0,1	0	0	0
Raspberry	0	0,4	0,3	1,7	0,2	0,1	0
Total	6 065,0	11 298,4	5 985,9	6 820,1	9 249,0	11 765,2	15 650,9

Table 2. Quantities of wild berries supplied for sale (Maaseutuvirasto, 2013, p. 26).

The supplied quantities for sale have varied a lot between the years depending on the yield caused by the weather conditions. The year 2012 has been the best with respect to bilberry and lingonberry due to substantial yield, as well as the years 2010 and 2011 for lingonberry. The first three berries (bilberry, lingonberry, and cloudberry) form the major of the total quantity, and the quantities of the rest seven berries are low. (Maaseutuvirasto, 2013, p. 10)

The shares of sales picked by domestic berry pickers was 19 per cent (in 2011) and 22 per cent (in 2012); foreign berry pickers 78 per cent (in 2011) and 47 per cent (in 2012); and no information 2 per cent (in 2011) and 31 per cent (in 2012) (Maaseutuvirasto, 2013, p. 19). Without foreign wild berry pickers the quantities of the picked berries would remain remarkable lower, and the most of the yield would remain in the forests. The foreign berry pickers working in groups are easy to guide to the areas where wild berries are available. (Maaseutuvirasto, 2013)

The incomes from the three wild berries for the berry pickers in 2012 are introduced in Table 3.

Type of berry	Quantity mill. kg	Income €	Average price for the pickers €/kg	Average price for the pickers (uncleaned/cleaned) €/kg
Bilberry	6.8 mill. kg	12.2 mill. €	1,79 €	1,78 €/2,94 €
Lingonberry	8.7 mill. kg	11.6 mill. €	1,33 €	1,32 €/2,03 €
Cloudberry	0.112 mill. kg	1.4 mill. €	12,93 €	N/A
Total	15.512 mill. kg	25.3 mill. €		

Table 3. Income from the wild berries in 2012 (Maaseutuvirasto, 2013, p. 23; 39).

In 2012, the price of uncleaned bilberries for berry pickers was 1.79 €/kg and cleaned bilberries 2.94 €/kg (Maaseutuvirasto, 2013). The average prices paid for the berry pickers in 2012 have varied between 1.68 € – 3.13 €/kg with respect to bilberry, and 1.29 € - 1.59 €/kg lingonberry (Maaseutuvirasto, 2013, p. 33). The average price with respect to cloudberry has varied between 12.21 € - 13.92 €/kg (Maaseutuvirasto, 2013, p. 38). Naturally the yield has an impact on the price levels. As Kangas (1999) found, “domestic price was negatively dependent on the amounts of lingonberries demanded in the domestic markets and positively dependent on the export price”.

In 2012, the total income from the wild berries for the berry pickers was 25.3 mill. €, and the percentage of wild berries of that was 98 per cent (Maaseutuvirasto, 2013, p. 6). Regionally the income was distributed in four areas as follows: Eastern Finland (51 per cent); Oulu province (25 per cent); Lapland province (20 per cent); and Western Finland (4 per cent) (Maaseutuvirasto, 2013, p. 6).

3.2 Imports and exports of wild berries

The imports and exports of bilberries and lingonberries between 2006 and 2012 are introduced in Table 4.

Year	Bilberry (<i>Vaccinium myrtillus</i>)				Lingonberry (<i>Vaccinium vitis-idaea</i>)	
	Imports (fresh) CN08104030 1000 €	Imports (frozen) CN08119050 1000 €	Exports (fresh) CN08104030 1000 €	Exports (frozen) CN08119050 1000 €	Imports (fresh) CN08104010 1000 €	Exports (fresh) CN08104010 1000 €
2006	1 137,3	11 220,6	231,5	10 625,4	323,5	12,4
2007	2 012,2	4 355,4	824,9	12 290,7	315,9	420,6
2008	2 813,7	3 522,5	503,8	15 627,2	1 042,1	20,9
2009	2 442,6	7 059,5	117,0	6 479,5	1 619,9	7,3
2010	1 686,4	4 462,4	235,4	12 097,9	237,2	5,1
2011	537,9	13 737,6	391,9	12 346,7	186,1	921,7
2012	1 568,6	14 487,6	1 241,3	12 257,1	171,1	1 486,9

Table 4. Imports and exports of fresh and frozen bilberries and fresh lingonberries between 2006 and 2012 (Finnish Customs, 2013).

In 2012, fresh bilberries were imported from Sweden, Netherlands and Spain, and frozen bilberries were imported from Sweden, Russia, Estonia, Poland, and Belarus. The most important countries in bilberry exports were Sweden, China, Germany, Japan, Poland and Spain. (Finnish Customs, 2013) Lingonberries were imported from Sweden and exported to Sweden. Surprisingly, the trade of bilberries was imports intensive, and the situation in 2011 was the same. The trade of lingonberries in 2011 and 2012 was export intensive. However, the quantities of exports with respect to lingonberries have been lower compared to bilberries, although the annual yield has been higher, which means that the domestic consumption has been met.

4 Materials and methods

Annual yield estimates were collected from Metla's (2013b) yield estimates published on the Internet. Secondary data comprising statistics with respect to quantities supplied for sale as well as the income from wild berries in 2012 was collected from Maaseutuvirasto's (2013) publication.

Statistics of imports and exports was collected from Finnish Customs (2013) Uljas databank. The numbers of foreign berry pickers are based on issued visas (Ministry for Foreign Affairs of Finland, 2013) and previous research. Moreover, articles in newspapers have been utilized.

5 Results: Actors and challenges in the supply chain of wild berries

In Finland, forest land and marshes are owned mainly by private people. The shares of *forest land ownership* are as follows: private persons and families 45 per cent; estates of the deceased persons 7 per cent; deemed partnership 10 per cent; jointly owned forests 2 per cent; state 24 per cent; municipalities, parishes, and other public associations 3 per cent; and forest industry companies/limited companies 9 per cent. (Metla, 2013a) “Everyman’s right” allows everyone to pick wild berries and walk in the forests notwithstanding what the ownership is. The challenge has come up, whether “everyman’s right” allows also commercial wild berry picking.

Domestic berry pickers are mostly aged people living in rural areas. They are used to pick wild berries and walk in the forest areas. Most people pick wild berries for their own use, for their relatives and neighbours, and not for sale. The income from picking berries is tax-exempt for the pickers. Pouta et al. (2004) found out that wild berry picking is linked to a rural lifestyle, and especially to the lifestyle of older generations, and the use of summer cottage. According to Roininen and Mokka (2007), the number of domestic wild berry pickers is about 15 000. The low number of berry pickers is the limiting factor to increase the quantity of picked berries (Roininen and Mokka, 2007). For example, 56.5 mill. kg of wild berries were picked in 1997 by 60 per cent of all households. Berry pickers were found predominantly in the rural areas and northern parts of the country, while berry buyers were characteristically urban people living in southern Finland. (Kangas, 2001) Because the domestic berry pickers are ageing and the younger generations are not interested in berry picking, the challenge is how to increase the number of domestic berry pickers.

Most of the *foreign berry pickers* come from Thailand, Ukraine and Russia (Table 5). The wild berry pickers who are the EU citizens do not need a visa, which means that the number of foreign wild berry pickers is higher than the numbers indicated in Table 5.

Country	Year	2010 Number of issued visas	2011 Number of issued visas	2012 Number of issued visas	2013 Number of issued visas
Russia		475	429	480	160
Thailand		2 398	2 398	2 774	3 229
Ukraine		670	600	611	950
Total		3 543	3 427	3 865	4 339

Table 5. The number issued visas for foreign wild berry pickers between 2010 and 2013 (Ministry for Foreign Affairs of Finland, 2013).

The first foreign berry pickers' group (92 pickers) from Thailand came in 2005 invited by a company. Since that wild berry pickers have come also from Belarus, Mongolia and Vietnam. (Rantanen and Valkonen, 2011) The wild berry pickers are invited by the berry companies (Maaseudun Tulevaisuus, 2013).

In the recruiting process in Thailand, the other actors in addition to berry pickers are coordinators; coordinators' assistant coordinators; assistant coordinators' assistant coordinators; financiers; authorities of the berry pickers' country; and Finnish authorities. In Finland, cooks and camp managers belong to the foreign berry pickers' group. (cf. Rantanen and Valkonen, 2011)

The wild berry pickers are not the employees of the companies. However, there are still different kinds of opinions on that issue (Rantanen and Valkonen, 2011). The foreign pickers pay their own air flight tickets to Finland, their food, accommodation, and fuel for the cars supplied by the berry companies. Their income is based on the sold wild berries. The role of the Finnish companies is to invite them and organize their visa. (Luonnosta Sinulle, 2007) The challenge related to the roles and responsibilities of different actors in the "recruiting" process in Thailand and Finland have to be clarified in order to that the financial and other problems caused for the foreign berry pickers could be minimized and avoided (cf. Rantanen and Valkonen, 2011). The report (HS, 2014) stated that there are characteristics of human trafficking with respect to berry pickers coming from Thailand. However, there are no easy solutions to that problem. One solution is that the berry pickers are employees of the berry

company that buys the wild berries. Yle's (2014a) article reminds that the berries can be sold tax free, but if they are picked on salary basis, the income is then taxable.

Berry agents are the private entrepreneurs or the representatives of berry companies who buy the berries from the wild berry pickers. The berry agent have to pay VAT, when selling the wild berries forward, if not working on a commission basis.

The *number companies operating in the trade and processing of berries* and mushrooms is about 500 companies, and about ten of them are big picking or processing companies (Luonnonvarainneuvosto, 2009). In 2013 there were 17 berry companies who had the right to invite the foreign berry pickers outside EU. In 2011, the number of companies was nine. (Yle, 2013) Luonnontuoteteollisuusyhdistys (2004) has 11 member companies, who take care of their own sector's trusteeship in Finland and in the EU. Luonnontuoteteollisuusyhdistys (2013) has published for the berry companies and berry pickers the principles, that follow ISO 26000 guidelines on social responsibility.

Industries using wild berries in their production processes are food industry, pharmaceutical industry, and cosmetics industry. The most important sectors in food industry are juice and jam industry (Roininen and Mokka, 2007). One potential industry, where the consumption could be increased, might be the convenience food industry (Roininen and Mokka, 2007). The degree of processing bilberries and other wild berries is rather low in Finland. Instead of processed products, a majority of the commercially utilized berries are exported as frozen raw material for the processing industry abroad. (Paasilta et al., 2009, p. 33) E.g. wild berries are sold to Japan where they are processed (Yle, 2014b). The challenges are how to add value to the wild berries by processing, and increase the quantities of domestic wild berries in order to that the demand of food, pharmaceutical and cosmetics industries could be met.

6 Summary

The actors in the supply chain and consumption of wild berries are summed up in Table 6.

<p>Ownership of forests and marshes:</p> <ul style="list-style-type: none"> - private persons and families, 45 per cent - estates of deceased persons, 7 per cent - deemed partnerships, 10 per cent - jointly owned forests, 2 per cent - state, 24 per cent - forest industry companies/limited companies, 9 per cent - municipalities, parishes, and other public associations, 3 per cent
<p>Yields of wild berries (The Finnish Forest Research Institute makes the yield estimates):</p> <ul style="list-style-type: none"> - Yields vary a lot between years. - Yields are best in the Eastern and the Northern Finland. - Only 3 – 10 per cent of the yield is picked.
<p>Berry pickers:</p> <ul style="list-style-type: none"> - Domestic aged people living in rural areas (for their own use): 15 000 pc. - Foreign (Thailand, Russia, Ukraine, Hungary, Mongolia, Baltic states): > 4339 pc.
<p>Buyers:</p> <ul style="list-style-type: none"> - Consumers on the market (for their own use) - Consumers delivered to their home (neighbours, relatives) - Tourists - Local retail shops - Berry companies - Berry agents
<p>Berry companies:</p> <ul style="list-style-type: none"> - Berry companies (selling uncleaned berries) - Berry companies (purchasing, cleaning, processing, freezing) - Subcontractors to berry companies - Exporting berry companies - Berry freezing companies - Food industry companies
<p>Consumption of wild berries in professional kitchens:</p> <ul style="list-style-type: none"> - Private professional kitchens (restaurants, coffee shops etc.) - Public professional kitchens
<p>Consumption of wild berries in food industries:</p> <ul style="list-style-type: none"> - Alcohol and wine industry companies (alcohol and non-alcohol drinks, wines, liqueurs) - Bakeries (pastries) - Berry processing companies (dried berries, berry powders, berry roughages, berry flavours) - Convenience food companies (desserts, soups, porridges) - Dairy industry companies (yoghurts, sour whole milk) - Flour-mill industry companies (cereals, porridges) - Fruit preparation industry companies - Jam industry companies (jams, jellies, marmalades, syrups, purée) - Juice industry companies (concentrates of juice, juices) - Other food industry companies (baby food, colourings, extracted oils, colourings for food stamp, food colour additives)
<p>Consumption of wild berries in pharmaceutical industry</p>

<ul style="list-style-type: none"> - Pharmaceutical industry companies <p>Consumption of wild berries in cosmetics industry</p> <ul style="list-style-type: none"> - Cosmetics industry companies utilizing wild berries as raw materials

Table 6. Actors in the supply chain and consumption of wild berries in Finland.

Kangas (1999; 2001) discussed about the ownership of wild berries. Before collection wild berries can be classified as being public goods, but after gathering they become the private property of the picker. When sold they are market commodities and have a market price formed by the interaction of supply and demand. We can continue that discussion from the viewpoint of the role of wild berries in consumption. When sold to consumers, berries become a source of nutrition. When sold to b-to-b customers on export market, berries are commodity products. When sold to different sectors in the food industry, the berries are commodity products and become a raw material, and after processing, an ingredient in a product. When sold to pharmaceutical industry, berries become a vital element that has a targeted impact on health. When sold to cosmetics industry, berries become an element in a cosmetic product “improving” something.

7 Discussion and challenges

Picking wild berries in Finland has become an international phenomenon with multiple actors. Wild berries as valuable natural resources belonging to “everyman’s right” have moved towards organized commercial business in the form of invited foreign berry pickers, especially from Thailand. When wild berry picking has moved towards commercialized picking, the question has arisen, whether the commercial berry picking utilizing privately own forest areas and marshes should belong to everyman’s right also in future. However, because of high number of private land owners, the idea that every land owner issues a permission to allow wild berry picking is too bureaucratic. Also picking berries from the forest areas and marshes owned by the state, municipalities and companies is difficult to organize. There is a challenge with respect to “everyman’s right” vs. commercial picking.

Annual yields of wild berries vary a lot. Only 3 – 10 per cent of annual yield is picked and the rest of the yields remains in the forest and marshes. However, there is more demand for wild

berries than they can be supplied for sale. In order to increase the percentage and the quantities of picked wild berries, both the number of domestic (especially younger generations) and foreign berry pickers have to be increased. The challenge is how to increase the percentage of picked berries compared to the annual yield.

Wild berry picking might play a more important role especially in the Eastern and the Northern Finland as an extra source of income, because the yield is there the highest. Subsequently, the number of berry pickers should be increased, by activating local people, and especially the younger people. The challenge is how to increase the income from berry picking by activating the local people.

One of the biggest groups among the foreign berry pickers are pickers from Thailand. They take a big personal financial risk in travelling to Finland and taking a loan to finance their travel, visa, and other costs without knowing whether they can pick and sell enough berries to cover their costs. Before the trip, their real costs (recruiting fees, air flight tickets, accommodation, food, fuel, insurances, etc.) are unknown as well as the net income, too. The challenge related to the roles and responsibilities of different actors in the “recruiting” process in Thailand and Finland is how to avoid or minimize the financial and other problems caused for the berry pickers (cf. Rantanen and Valkonen, 2011).

With respect to consumers, the demand of berries is expected to increase due to new Finnish nutrition recommendations (cf. Valtion ravitsemusneuvottelukunta, 2014). Moreover, the various sectors in the Finnish food industry could consume more domestic wild berries, if only berries could be supplied. There is also increased demand for exports if the quantities of picked berries could be increased. Notwithstanding the large forest areas and marshes, Finland is importing bilberries. There is a challenge how to increase wild berry picking with respect to lingonberries and bilberries which will result in the increased income from exports and decrease the imports of bilberries.

If the different sectors in the Finnish food industry want to increase the consumption of wild berries and develop new business based on wild berries, the quantities delivered for sale have to be increased. That is why, in order to guarantee the domestic supply of wild berries for the food industry, the percentage of picked berries with respect to annual yield have to be raised

in spite of variations in annual yields and prices (cf. Rantanen and Valkonen, 2011). The challenge is how to increase the percentage of picked berries related to annual yield.

The consumption of wild berries as a raw material in pharmaceutical and cosmetics industries is still quite low. In order to increase the value added of wild berries, the consumption of wild berries could be increased as a raw material both in pharmaceutical and cosmetics products.

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Vitae

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