

Trade of Main Wild Berries in Finland

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Kangas, K. 1999. Trade of main wild berries in Finland. *Silva Fennica* 33(2): 159–168.

The price trends and markets of the main wild berries, bilberry (*Vaccinium myrtillus* L.) and lingonberry (*Vaccinium vitis-idaea* L.), were analysed in this study, which covered both domestic use of berries, imports and exports. The periods considered were for bilberries from 1988 to 1997 and for lingonberries from 1979 to 1994. The results indicated that both exports and imports have increased and domestic berries have lost their market share to imports in domestic use. One possible explanation for this trend was found in price development. Both export and import prices have decreased, but export price has still been higher than the import price. Simultaneously the domestic price has decreased the fastest.

The formation of the price of lingonberries paid to the pickers in the organised domestic markets was studied with a regression model. The results indicated that domestic price was negatively dependent on the amounts of lingonberries demanded in the domestic markets and positively dependent on the export price. Correlation analysis gave evidence on the same kind of relations concerning bilberries.

Keywords non-wood forest products, trade, bilberry, lingonberry, exports, imports

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Received 3 December 1998 **Accepted** 17 May 1999

1 Introduction

1.1 Background

Collection of wild berries has always had a special position among the non-wood uses of forests in Finland. Wild berries have been important as a source of food, income and export earnings. Additionally, collection has also been a popular leisure activity. Several studies have been prepared on the amounts of collected berries by Finnish households in different localities and

regions (e.g. Raatikainen 1978, Raatikainen and Raatikainen 1983, Rossi et al. 1984, Salo 1984, Salo 1985, Kujala et al. 1987, Saastamoinen and Lohiniva 1989, Saastamoinen et al. 1998). Some of the studies, in part, include economic information. Systematic annual statistics on the trade of wild and cultivated berries has been compiled since 1977 (Malin 1998). Also household surveys, industrial statistics and national accounting for example, all compiled by Statistics Finland, provide useful annual or periodic data in their specific fields.

For example, national accounts indicate that the total value of picking was in 1991 341 million FIM, which meant 3 percent of the value of timber. Regionally this proportion can be much higher (Saastamoinen 1995). Salo (1985) estimated that the relative value of the crop of wild berries and mushrooms, including home consumption and for sale, compared to that of wood production in Suomussalmi commune was as high as 15.4 percent in 1982. The seasonal employment provided by commercial picking is not well-known, but according to a recent working group, employment effects of export related activities in wild berry gathering is 900 person years (Keräilytuotealan... 1995). These estimates, although tentative, indicate that wild berries by no means are economically insignificant. However, there are limited studies concerning systematically the economic aspects of collection of wild berries and mushrooms.

There has been a discussion on the current state and future of the wild berry industry in Finland. It has been stated that the value-added tax levied on industrial use of wild berries has weakened the competitiveness of domestic berries and together with low cost imports lowered the price paid to the domestic pickers. Thus, the purpose of this study was to analyse the development of the markets of main wild berries in Finland, bilberry (*Vaccinium myrtillus* L.) and lingonberry (*Vaccinium vitis-idaea* L.). The study aimed to examine, if domestic berries have been substituted by imports for domestic consumption and if there have been changes in the level and use structure of domestic berries. Price trends were calculated in order to demonstrate the development of domestic price, import and export prices as well as to examine if that development have been one possible explanation for the changes in the market structure. The relationships in the markets, especially factors affecting the domestic price, were examined with correlation and regression analysis.

1.2 Economic Characteristics of Wild Berries

From the standpoint of economic theory, wild berries have interesting characteristics. Before

collection they can be classified as being public goods (e.g. in Finland, for example, free for everybody) but after gathering they become the private property of the collector. When sold they are market commodities and have a market price formed by the interaction of supply and demand. Saastamoinen (1995) has called them semi-public goods.

The term public good has been criticised because of inconsistent definition. Randall (1987) avoids this term and prefers a classification based on excludability tied to ownership and rivalry concerning the consumption of a good. Wild berries are non-excludable because they are not tied to land ownership due to everyman's right. This situation prevails mostly in Finland. The only exception is northern Lapland, where there is a possibility of prohibiting commercial picking of cloudberries other than local people (Rekola 1998). In this particular case cloudberries can be regarded as a club commodity. Wild berries are also non-rival to a certain extent. However, rivalry between pickers can appear in the most popular places, which are often situated near roads. Rivalry is most obvious concerning cloudberries, which are sometimes picked before the crop isn't even ripe. In spite of problems in classifying wild berries as being between private and public goods, the most important feature of wild berries as a commodity is that picking is not tied to land ownership. It has a strong positive impact on the utilisation rates in Finland, where these rates compared to biological crops are generally rather low.

Relating to the nonexistent ownership rights berries have no "stumpage price" like trees. From the economic point of view a berry crop has no value and price except potentially as a target of picking (Saastamoinen 1978). Value for the berry crop is not formed until human work is related to picking activities. The income received from commercial collecting is regarded as labour income. One traditional feature related to picking is also that income received from commercial collecting in Finland is tax free for the picker – a characteristic often criticised by the Ministry of Finance but held due to political pressures. Other actors of the production chain pay taxes, of course.

1.3 Derived Demand of Wild Berries

A characteristic feature affecting the markets of wild berries is a strong annual variation in the biological crop. It has a negative impact on the markets and processing industries (Saastamoinen 1998). For example it has been estimated that the national biological crops of lingonberry varies between 200 and 500 million kilograms (Salo 1994). Attempts to forecast wild berry yields have been made (Raatikainen et al. 1984, Pukkala 1998) and recently, a systematic approach for annual yield forecasting has been developed by the Finnish Forest Research Institute (Salo 1998).

Although the yield varies annually very remarkably, the biological resources usually do not restrict the supply. Depending on the species, the amount collected annually varies from one to 10–15 percent of the biological yield (Raatikainen 1978, Salo 1995). This phenomena relates to a term called economically potential yield which is always much lower than the biological resources (Saastamoinen 1996). After a certain amount additional picking is not profitable from the collectors' point of view. Biological yield is the primary determinant of the economically potential yield, but not as decisively as the price and costs of picking which determine the profitability of collecting. When biological resources are low, the decreasing supply tends to increase the price.

Factors affecting demand are export prospects, domestic demand, import, stocks and substitutes (Saastamoinen 1995). The demand for wild berries is indirect like other factors of production and can be driven from the demand of end products as in the case of wood (Klemperer 1996).

Companies, which clean and freeze berries, buy annually 5–10 million kilograms of berries, from which the main part is exported to Central Europe for the food industry. There are also about ten industrial plants, which use wild berries in their products (Keräilytuotealan... 1995). Approximately a million kilograms of wild berries are used in jams and marmalade, in frozen berries about 0.5–0.8 million kilograms and in alcoholic drinks 0.5 million kilograms annually.

Besides domestic industrial and other uses it can be concluded that export strongly regulates the amounts of wild berries supplied in the or-

ganised markets. In volumes, lingonberry is the most important exported berry in Finland. During the research period the main export countries for lingonberries have been Sweden and Germany. The main import country for lingonberries has been the former Soviet Union and later Russia.

The proportion of Germany and Sweden of bilberries exported has been about half. Among the single export countries Austria has been the third one. Until 1992 the former Soviet Union and later Russia was the most important import country for bilberries but in 1993 Estonia became the main import country with 65 percent share of bilberries imported. Since then Estonia has dominated the imports of bilberries.

2 Material and Methods

Statistics of annual quantities and values of berries bought by organised trade and industry have been compiled from 1977 first by the Market Research Institute of Pellervo Society (e.g. Kujala et al. 1989) and later by Food and Farm Facts Ltd (e.g. Malin 1998). Statistics are based on annual inquiries directed to the companies in the wild berry industry. These statistics don't include direct trade to e.g. kitchens and restaurants or retail trade in market places. This study focused on the amounts and prices of bilberries and lingonberries from 1977 to 1997. All prices were deflated by the wholesale price index. This study covered also the export and import of lingonberries and bilberries. Amounts were from export and import statistics (Foreign trade...). Export and import prices are unit values, which have been constructed by dividing the annual values of exports and imports by the corresponding quantities. These statistics on frozen bilberries were available from 1979–1997 and fresh blueberries from 1988–1997. It should be noted that fresh bilberries included also cranberries (*Vaccinium oxycoccos* L.) from 1988 to 1995. Volumes of cranberries were however insignificant compared to bilberries, not causing perhaps any remarkable bias on the results. The statistics on frozen lingonberries were available from 1979–1994 and fresh lingonberries from 1977–

1997. Domestic use of berries was divided into domestic berries and imports. The quantities of domestic berries used domestically were calculated by excluding exports from the domestic supply. The quantity of domestic industrial use was calculated by excluding exports from the domestic supply plus imports.

Trends of prices and quantities were analysed by linear trend functions estimated by the ordinary least square (OLS) regression. The proportional growth in y per unit time (t) is given by

$$\frac{dy/dt}{y} = \frac{ry}{y} = r \tag{1}$$

Percentage growth rate was arrived at by multiplying the estimate of r by 100. The function (1) is linearised:

$$\ln y = \ln \alpha + \ln(e^{rt}) = \ln \alpha + rt \tag{2}$$

A direct estimate of the growth rate, r , is obtained by regressing the logarithm of y against t (Dougherty 1992). Standard deviation of the residuals multiplied by 100 was used to describe the fluctuations (Willman 1975).

The basic relationships between prices and quantities in the wild berry markets were examined first with correlation analysis in order to get information especially on the factors affecting the domestic price. The formation of the demand price of lingonberries, i.e. the price paid to the pickers in the domestic organised markets, was studied also with ordinary least squares regression (OLS). Availability of the data restricted both the length of the estimation period and number of the potential predictors. Time series for bilberries were not long enough for estimation. A model for domestic price of lingonberries with two independent variables was built. The estimation period was 1979–1994. Estimates of annual biological crop level and stocks were not available. The domestic demand price was hypothesised to be negatively dependent on the amounts of lingonberries demanded in the domestic organised markets and positively dependent on the export price of lingonberries

$$\text{DPR} = f(\text{DEM}, \text{EPR}) \tag{3}$$

where

DPR = the price of lingonberries paid to the pickers in the domestic organised markets, FIM/kg

DEM = demand for domestic lingonberries in the domestic organised markets, tons

EPR = export price of lingonberries, FIM/kg.

Logarithmic transformations were used. Then the equation for estimation was

$$\ln \text{DPR} = a_0 + a_1 \ln \text{DEM} + a_2 \ln \text{EPR} + u \tag{4}$$

where

$a_1 < 0, a_2 > 0$.

3 Results

3.1 Market Shares and Prices of Bilberries

The structure of bilberries use in Finland is presented for the two periods in order to describe the structural and quantitative changes which occurred in the use of blueberries over time (Table 1).

The annual average of domestic supply has decreased 149 tons during the latter period. It can be a result of crop variation; year 1993 was the poorest year in berry yield during the latest two decades. Despite of decreasing domestic supply, the average of exports has increased by 408 tons. Export has become the most important use category of domestic berries in the latter period with a 51.2 percent market share. In 1988–1992 the domestic processing industry still used 72.6 percent of domestic blueberries.

The structure of domestic industrial use has changed although the total average of domestic consumption has been quite stable in both periods. The annual average of domestic berries used domestically has decreased 37.6 percent, while imports have increased 31.7 percent, representing already 60.5 percent of industrial use of bilberries in the latter period.

An increasing trend in both exports and imports was also apparent when growth rates were considered (Table 2). Both exports and imports have increased annually about 15 percent. Fluc-

Table 1. Use of bilberries in Finland in 1988–1997.

	1988–1992		1993–1997	
	Mean 1000 kg	Market share %	Mean 1000 kg	Market share %
Use of domestic berries				
Exported	559.4	27.4	967.2	51.2
Domestic use	1480.5	72.6	923.6	48.8
Total	2039.9	100	1890.7	100
Industrial use				
Domestic berries	1480.5	58.0	923.6	39.5
Imports	1073.4	42.0	1413.6	60.5
Total	2553.9	100	2337.2	100

Table 3. Use of lingonberries in 1979–1994.

	1979–1986		1987–1994	
	Mean 1000 kg	Market share %	Mean 1000 kg	Market share %
Use of domestic berries				
Exported	1265.5	44.2	3843.3	72.8
Domestic use	1595.5	55.8	1439.0	27.2
Total	2861.0	100	5282.2	100
Industrial use				
Domestic berries	1595.5	89.0	1439.0	75.7
Imports	197.4	11.0	461.0	24.3
Total	1792.9	100	1900.0	100

tuations have however been considerably stronger in imports. The import price has decreased slightly faster, by 2.8 percent annually, compared to the export price that has increased annually by 2.3 percent. Fluctuations in prices have been weaker than in amounts and the import price has varied more strongly than the export price. The average price of exports, weighted by quantities of fresh and frozen bilberries, was in the first period 10.9 FIM/kg and in the latter period 10.3 FIM/kg. The import price has been considerably lower, at 7.9 FIM/kg in the first period and 7.4 FIM/kg in the latter period. A decreasing trend however has been steepest in the domestic price. It has decreased 7.2 percent per year and fluctuations have been quite weak compared to import and export prices.

Table 2. Growth rates (%/a) and fluctuations (measured by standard deviation of residuals multiplied by 100) in prices and volumes of bilberries in 1988–1997.

	Growth rate %/a	SDresid
Imports	+15.5	83.9
Import price	-2.8	27.4
Exports	+15.0	53.7
Export price	-2.3	16.2
Domestic price	-7.2	8.6

Table 4. Annual growth rates (%) and fluctuations (measured by standard deviation of residuals multiplied by 100) of prices and volumes of lingonberries in 1979–1994.

	Growth rate %/a	SDresid
Imports	+6.6	154.6
Import price	-2.2	51.2
Exports	+11.2	77.8
Export price	-4.9	37.8
Domestic price	-5.9	36.6

3.2 Market Shares and Prices of Lingonberries

Domestic supply of lingonberries has been almost two times higher in the latter period from 1987 to 1994 (Table 3) and all of this increase has been exported. Domestic use was the main use category of domestic lingonberries in the first period with a 55.8 percent market share. In the latter period the average of exports has been three times higher than in the first period representing already 72.8 percent of the use of domestic supply.

In spite of the increasing domestic supply, imports have been over two times higher in the latter period. Domestic berries have dominated in industrial use in both periods, but their market

share has decreased from 89 percent to 75.7 percent in the latter period.

Growth rates also indicate, that exports of lingonberries have grown faster than imports (Table 4). The annual growth rate of exports has been 11.2 percent, while imports have grown 6.6 percent and fluctuated very strongly. The export price was in 1979–1986, 17.1 FIM/kg on average and in the latter period it was 10.2 FIM/kg. Decrease in the import price was also clear. It was 10.6 FIM/kg on average in the first period but only 7.5 FIM/kg in the latter period. The domestic price has although decreased the most rapidly at 5.9 percent per year. Fluctuations have been stronger in amounts than in prices.

3.3 Relationships in the Markets

The basic relationships between prices and quantities were examined first with correlation analysis in order to get information especially on the factors affecting the domestic price. The domestic price of lingonberries had a strong positive correlation with the export price and negative correlation with quantity of lingonberries bought in organised domestic markets (Table 5). Import and export prices had a weak positive correlation. Between 1979 and 1994, there are certain periods where export and import prices have diverged, especially in 1983, 1987–1988 and 1991–1992 (Fig. 1).

The formation of the price of lingonberries paid to the pickers in domestic organised mar-

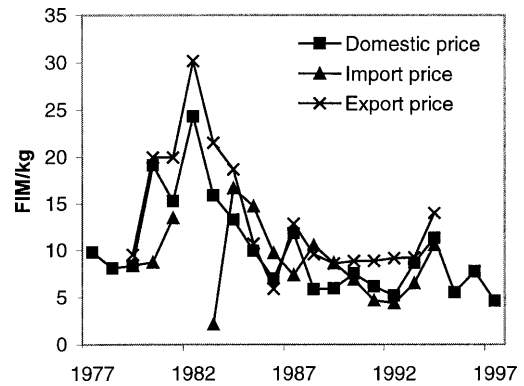


Fig. 1. Real prices of lingonberries.

kets was studied with regression analysis. Independent variables were demand for domestic lingonberries in the organised domestic markets (DEM) and export price of lingonberries (EPR) (Equation 4). As logarithmic transformations were used, the coefficients can be interpreted as elasticities (Table 6).

Elasticity between domestic price and amounts of lingonberries bought by organised trade and industry was significant and negative as expected. This supported the assumption that when the domestic demand for lingonberries increases, it lowers the price level. An explanation for that lays in good crop years, which encourage demand while prices can go down due to low cost supply. However, the annual demand for domestic berries does not necessarily reflect the crop

Table 5. Correlations between prices and amounts of lingonberries in 1979–1994.

	DTN	DPR	ETN	EPR	ITN	IPR
DTN	1.000	-0.391	0.767	-0.260	0.230	-0.365
DPR		1.000	-0.425	0.959	-0.390	0.196
ETN			1.000	-0.376	0.328	-0.384
EPR				1.000	-0.312	0.176
ITN					1.000	-0.298
IPR						1.000

DTN = domestic berries bought in organised markets
 DPR = domestic price in organised markets
 ETN = exports (tons)
 EPR = export price
 ITN = imports (tons)
 IPR = import price

Table 6. Regression model for the domestic price of lingonberries. OLS-estimates. Estimation period 1979–1994.

Variable	B	SE B	t	p
Constant	1.211	0.720	1.683	0.116
DEM	-0.148	0.076	-1.954	0.073
EPR	0.912	0.103	1.683	0.000
R ²	0.859			
Durbin-Watson	1.654			

B = coefficient, SE B = standard error of coefficient, t = value of t-test, p = risk level

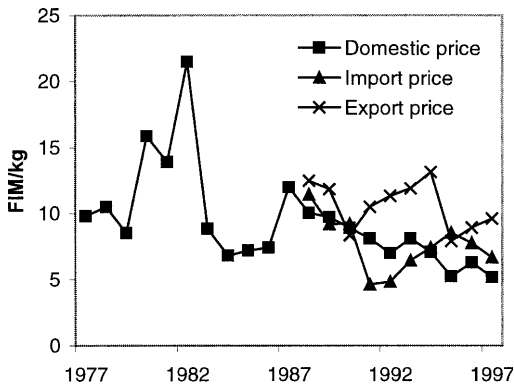


Fig. 2. Real prices of bilberries.

level perfectly. Stocks of berries from the previous year as well as export demand may have an effect on the domestic demand.

Lingonberry is the most important exported berry in Finland. Most of the harvested crop in 1987–1994 was exported (Table 3). However, it can be assumed that Finland does not have a significant impact on the international price level. With this assumption it can be concluded that export price reflected on the domestic price. The elasticity between domestic price and export price was significant and positive as expected.

The data concerning foreign trade of bilberries was not long enough for building a model. The relationships prevailing in the bilberry markets were examined only with correlation analysis. However, correlations gave evidence on the same

Table 7. Correlations between prices and amounts of bilberries in 1988–1997.

	DTN	DPR	ETN	EPR	ITN	IPR
DTN	1.000	-0.309	0.367	-0.252	-0.420	0.308
DPR		1.000	-0.594	0.500	-0.306	0.443
ETN			1.000	-0.263	0.164	-0.426
EPR				1.000	0.407	0.000
ITN					1.000	-0.638
IPR						1.000

DTN = domestic berries bought in organised markets
 DPR = domestic price in organised markets
 ETN = exports (tons)
 EPR = export price
 ITN = imports (tons)
 IPR = import price

kind of relations as the correlations and the model for lingonberries. Correlation between bilberries bought in organised domestic markets and price was negative (Table 7) and domestic price had a strong positive correlation with export price. Correlation between export and import price was weak as in case of lingonberries. Direction of import and export prices has been opposite in 1991 and 1995–1997 (Fig. 2). In 1991 imports started to increase while price went down.

4 Discussion

So far studies which deal with the collection of wild berries from an economic point of view, especially markets, are few. Recent discussion indicates that the economic dimension is important and deserves more attention. Development of the domestic price and the structure of the markets have been actual questions in the wild berry industry. The aim of this study was to analyse the development of prices and structure of the Finnish wild berry markets as well as to examine the relationships in the wild berry markets.

For both bilberries and lingonberries the market trend has been parallel. Exports have increased and domestic berries have been substituted by imports for domestic consumption. The annual crop variation can be high and affect these results but in this case it is not the only explanation.

The annual average of the domestic supply of bilberries has decreased. At the same time exports increased with an annual growth rate of 15.5 percent. During years the domestic bilberry has lost its market share to imports and in the latter period of 1993–1997 imports dominated domestic use with the market share of 60.5 percent.

Development of lingonberry markets and use has been somewhat different. Domestic supply was over two times higher in 1987–1994 than in 1979–1986 and the structure of consumption changed greatly. Domestic lingonberries lost their share to imports in domestic use and all of the increase in domestic supply was exported.

Exporting wild berries has always been impor-

tant but has become increasingly so in the current markets of Finnish berries. This trend is likely to continue, because in the domestic markets there hardly will be a remarkable increase in consumption. One possible explanation for this trend can be found in prices. Both export and import prices have decreased, but the export price has still been considerably higher than the import price. Simultaneously the domestic price has decreased fastest and it has become increasingly profitable to export more and substitute domestic berries with low cost imports. However, export markets are also tightening.

The model for the domestic price of lingonberries offered limited evidence on the factors affecting the domestic price level. Domestic price was positively dependent on the quantities of lingonberries traded in the organised domestic markets and negatively dependent on the export price of lingonberries. Correlation analysis gave same kind of evidence concerning bilberries. There are other factors affecting the domestic price and demand for wild berries, which remained outside of the study. In this study it was not possible to take the stocks of berries into account. Stocks can have an effect on both the quantity demanded and price level. For example, if a good crop year is followed by another good year, demand can be low because of large stocks from the previous year. Also if stocks are large, the price level does not react on the crop level even if it is low. Imports can have also a similar kind of effect. Industry uses low cost imports as a substitute to the domestic supply and as a consequence the domestic price level remains low.

As well as information on stocks of berries, also estimates of the annual biological crop would make analysis more reliable. These estimates would give also a possibility to study the effect of crop level on both prices and profitability of picking more carefully.

According to the results of this study, the market of wild berries in Finland has changed. The change may continue. Value-added tax levied on industrial use of wild berries has weakened the competitiveness of domestic berries and they have lost their shares to low cost imports in industry. However, exports of domestic berries have increased during the same period. Exports are im-

portant to the wild berry industry, but of course the export value would be higher if the berries were processed in Finland. However, even if the prices of domestic berries have gone down, the trade and processing industry are complaining of profitability problems (Rauwala 1998). The preferences of domestic consumers should be clarified. If they are willing to pay more for domestic berries and berry products, it should be taken into account in our industry.

Concern regarding the continuity of domestic supply is also apparent because of the ageing of pickers. Decreasing trends of prices also have a negative effect on continuity. The present and potential reserve of pickers should be assessed, including their price expectations. The productivity of picking activities should also be given attention. Biological resources are large and our wild berries have many good features, which could be utilised better in marketing. The importance of berry picking culminates in the less affluent areas, where picking for income is more and more important, but nevertheless effects on the national economy shouldn't be ignored.

Acknowledgements

The study is part of the project "Between Subsistence and Global Markets: Grassroot Economies, Social Structures and National Policies in Sustaining Non-Wood Forest Products", which belongs to the Finnish Biodiversity Research Programme FIBRE and is funded by the Academy of Finland. The author wishes to thank Olli Saastamoinen, Riitta Hänninen, Anssi Niskanen, Heikki Pajuoja, Elina Uitam and two anonymous referees for their contribution to the study, and Christopher Green for revising the language.

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