

Factors Affecting Participation in Wild Berry Picking by Rural and Urban Dwellers

Kari Kangas and Pasi Markkanen

Kangas, K. & Markkanen, P. 2001. Factors affecting participation in wild berry picking by rural and urban dwellers. *Silva Fennica* 35(4): 487–495.

The purpose of this study was to examine the participation of urban and rural dwellers in the activity of berry-picking. The respondents in the study lived in the city of Joensuu and in the municipality of Ilomantsi, in eastern Finland. 68% of Joensuu households compared with 82% of those in Ilomantsi participated in berry-picking. These evident differences in the participation rates may be largely due to the higher costs incurred by urban dwellers in picking, since the probability of participation was not significantly higher for Ilomantsi households compared with those in Joensuu who had access to a summer-cottage which was likely to be located near the berry resources. In both municipalities, the participants were divided into two groups according to the nature of their participation in the activity. The larger group – termed ordinary pickers – were characteristically younger families with children, while the other group, termed active pickers, were distinctly more advanced in age. The quantities picked for home consumption by the groups of pickers in Ilomantsi were twice as large as those picked by the corresponding groups in Joensuu. In Joensuu, households were not significantly involved in commercial picking.

Keywords non-wood forest products, wild berries, participation, household behaviour

Authors' address University of Joensuu, Faculty of Forestry, P.O. Box 111, FIN-80101 Joensuu, Finland

Fax +358 13 215 2590. **E-mail** kari.kangas@joensuu.fi

Received 12 June 2000 **Accepted** 20 November 2001

1 Introduction

The use of the natural environment for recreational purposes has become increasingly important in modern urban society. In the case of Finland, the sparse population, large forested areas and abundance of lakes have been able to meet many recreational needs. As a result of the policy of

open access, these resources are not only appreciated but also widely used, and the picking of wild forest berries has traditionally been one of the most important of the non-wood uses of the forests. As far as public opinion is concerned, picking berries and mushrooms are two of the modes of forest utilisation which rank higher than wood production (Kangas and Niemeläinen 1996).

As a result of the concentration of the population, people inhabiting different kinds of residences are faced with various different possibilities for outdoor recreation activities. Some activities, such as hiking, demand large, remote wilderness areas, while managed forests, which are abundant in the rural environment, are more suitable for activities linked with consumption, such as hunting, or picking berries and mushrooms. Hence, the urban forest areas are also extensively used and highly valued (Tyrväinen and Väänänen 1998). However, most of the uses of urban forests are non-consumptive while the potential for traditional consumptive uses remains linked primarily with forests in the rural areas.

The present-day involvement rates for berry picking are relatively high, regionally involving between 65% and 90% of the population in Finland (Kangas and Niemeläinen 1996, Liikkanen et al. 1993) and 56.5 million kg of wild berries were picked in 1997 (Saastamoinen et al. 2000). In Sweden it has been estimated that 78 million litres (approx. 47 million kg) were picked in 1977 (Hultman 1983) and 31.3 million litres (approx. 19 million kg) in 1995 for domestic use only (Skogstatistisk ... 1998). In Norway, the estimates range between 20 and 35 million kg (Friluftsliv ... 1985), and the estimate for 1989 was 28 million kg (Biological diversity ... 1992).

Studies concerned with berry-picking in Finland have reported high participation rates amongst urban dwellers (Sievänen 1993, Salo 1984, Ulkoilututkimus ... 1980, Saastamoinen and Lohiniva 1989, Kujala 1994), but, even so, systematic comparisons of berry-picking in the rural and urban areas are missing even in a country like Finland. In a number of studies individual factors affecting berry-picking have been examined separately (Raatikainen 1978, Rossi et al 1984, Salo 1984, 1985, Liikkanen et al 1993, Sievänen 1993, Kujala 1994). The method used in such studies has frequently been that of cross-tabulations, where the average amounts picked have been classified according to socioeconomic categories. Studies that have made use of any kind of modelling approach have been rare (Hallikainen 1998). As far as many other consumptive or non-consumptive wildlife uses are concerned, the more frequent method has been to explain participation by means of modelling factors, and

the results have been used to forecast recreational demand (e.g. Hay and McConnell 1979, Walsh et al. 1992).

The decision-making process involved in participation in berry-picking consists of two stages: firstly, whether to participate, and secondly, if people choose to participate then how intensively to participate. The factors affecting participation can be divided into two broad categories: socio-economic factors and resource variables. The choice of outdoor recreation activities and the intensity of participation vary according to the stages in the human life cycle (Cheek and Burch 1976). However, ageing does not necessarily affect the probability and intensity of participation in a parallel sense, nor does the relationship have to be linear. In addition, the phase in the family life cycle also moulds the selection of outdoor recreation activities and the time available for their pursuit.

In earlier studies participation in berry-picking has been found to be associated with, for example, middle age (Liikkanen et al 1993), lower education and gender (Kujala 1994, Hallikainen 1998) and a larger size of family (Kujala 1994). Whether these variables also have a parallel effect on the intensity of participation is uncertain.

Within a rural-urban framework resource availability relates in particular to the accessibility of the forest area. As the potential of urban forests for berry production is generally low and, as in the case of Finland, managed forests are abundant in the rural environment, rural dwellers have generally been faced with shorter distance to the berry resources. In one of the studies concerned with outdoor recreation in Finland (Ulkoilututkimus... 1980), the greatest dissatisfaction was expressed in connection with the relative resource availability for berry-picking by urban dwellers.

One of the most important factors which can affect the entry price, and hence also lower the start-up costs for some inhabitants in an area while not affecting others in the same area, is the availability of a summer cottage. Summer cottage owners are likely to confront a reduced start-up price, since berry-picking is likely to be a normal part of a visit to the summer cottage during the picking season.

The present study has aimed at examining the factors affecting participation in berry-picking

by urban and rural dwellers. In addition, the patterns of participation in the activity have been investigated and econometric models have been used to study the factors affecting such patterns.

2. Material and Methods

2.1 Material

The cases looked at in this study were located in the municipalities of Joensuu and Ilomantsi, in eastern Finland, where the role of berry-picking has traditionally been strong. Because these two municipalities are quite close to each other, the cultural differences are unlikely to be particularly large. Joensuu is a town of 50 000 inhabitants. Its degree of urbanisation (Indicates the proportion of population living in built-up areas to an accuracy of 10%) was 9 on a scale from 1 to 10 at the end of the year 1997 and the population density was 622.5 persons per km² (Statistical Yearbook ... 1999). For its part, Ilomantsi is a rural municipality of 7600 inhabitants and the degree of urbanisation was rated at 4 for the same year and the population density was 2.8 persons per km².

A random sample of 493 households in Joensuu and 318 households in Ilomantsi was taken from the Finnish National Population Register. Data was collected by means of postal questionnaires, which were mailed during the last quarter of 1997. After one call-back, the response rate was 63% for Joensuu and 61% for Ilomantsi, and the respondents represented 1% and 6% of all households in their respective communities.

The questions used in this study concerned the participation of the household in picking of wild berries, number of berry-picking trips made by each member of the household and the quantities picked by the whole household (see Kangas 2001 for the whole questionnaire). The amounts collected by a whole household for its own use and also for commercial purposes were enquired into according to the species of berries. Excluded from the study were details concerning berries collected from yards, gardens and fields. Respondents were asked to report the quantities picked in litres, since it was assumed that it would

be easier to recall the amounts that had been picked specially for home use in that manner.

2.2 Methods

Individuals who are interested in a given topic and are involved in the activities under examination are likely to respond more frequently or earlier than others who are less interested (Goyder 1987, Dillman, 1991, Martin 1994). In addition, in the case of the present study a decreasing trend was observed when the amounts collected and involvement in berry-picking were compared for successive waves of response. In order to reduce any possible bias in estimates of participation rates, a random sample of 21 non-respondents in Joensuu and 17 in Ilomantsi were interviewed by phone and generalised with respect to all of the non-respondents (Kanuk and Berenson 1975). Without non-respondent survey, the estimates of participation rates would have been too high.

The factors affecting participation in wild berry-picking were studied using the logistic regression model (Maddala 1983, Hosmer and Lemeshow 1989). The dependent variable in the logistic regression model is dichotomous, which in the present study is represented by participation of the household in berry-picking. The independent variables and their expected signs were:

- $x_1 = \text{age} < 41 = \text{respondent } 18\text{--}40 \text{ years of age}$ (?)
- $x_2 = \text{age } 41\text{--}60 = \text{respondent } 41 \text{ years or over, but under } 61$ (+)
- $x_3 = \text{age} > 61 = \text{respondent } 61 \text{ years or over}$ Ref.
- $x_4 = \text{respondent is a secondary school graduate, yes} = 1$ (-)
- $x_5 = \text{size of the family, continuous}$ (+)
- $x_6 = \text{respondent in Ilomantsi, summer cottage available, yes} = 1$ (+)
- $x_7 = \text{respondent in Ilomantsi, summer cottage not available, yes} = 1$ (-)
- $x_8 = \text{respondent in Joensuu, summer cottage available}$ Ref.
- $x_9 = \text{respondent in Joensuu, summer cottage available, yes} = 1$ (-)

Since there were a large number of berry-pickers in both municipalities, they were grouped in order to gain a more comprehensive overview of the underlying structure of the pickers involved. As a

link was wanted between the underlying structure of pickers and their patterns of picking, logistic regression analysis was used also when examining the factors affecting the activity of picking. The households which had collected berries were separated into two groups by means of the K-means clustering method (Anderberg 1973) according to the amount of berries collected and the number of trips made for the purpose of berry-picking. The variables initially concerning the whole household were divided by the size of the household and then further standardised.

In both municipalities two groups were found which differed from each other with regard to the activity of berry-picking. The factors affecting the picking activity were analysed separately for each municipality. In the two resulting logistic regression models that were constructed, the dependent variable was for the individual either to be a member of the active group (coded 1) or to be a member of the less active group (coded 0). The independent variables were those presented above, excluding the variable indicating the municipality, since the models were estimated for the two municipalities separately.

3 Results

3.1 Factors Affecting Participation in Berry-Picking

Picking wild berries was popular in both municipalities. In Joensuu 68% of all households and in Iloantsi as many as 82% participated in berry-picking in 1997. The results also indicated that the availability of a summer cottage for the Joensuu respondents and the size of the family increased the probability of a particular household's participation in the activity (Table 1). In this respect, the results were consistent with our hypotheses. The odds on participation were 4.8 times greater for households within Joensuu that also owned (or had regular access to) a summer cottage than for households within Joensuu but lacking ownership of (or regular access to) a summer cottage. It was also noticeable that the impact of access to a summer cottage for Joensuu respondents exceeded the impact of urban residence itself.

Table 1. Logistic regression model for the probability of participation of households in wild berry picking. Coefficients (Wald statistics in parenthesis) and odd ratios (95% confidence interval, CI).

Independent variable	Coefficient (Wald)	Odds ratio (95% CI)
Constant	1.300** (8.195)	
Age		
age < 41	0.379 (0.987)	1.46 (0.69;3.09)
age 41–60	0.210 (0.356)	1.23 (0.62;2.46)
age > 60	Reference group	
Secondary school graduate	-0.543 (3.396)	0.58 (0.32;1.04)
Size of the family	0.411*** (11.903)	1.51 (1.19;1.90)
Residence and summer cottage availability		
Iloantsi		
Summer cottage available	0.024 (0.001)	1.51 (0.26;4.01)
Summer cottage not available	-0.465 (1.063)	0.63 (0.26;1.52)
Joensuu		
Summer cottage available	Reference group	
Summer cottage not available	-1.583*** (16.812)	0.21 (0.10;0.44)
Observations	453	
Log-likelihood	-196.22	
Chi-square	53.63	
Significance	0.000	
Observations correctly classified, %	82.12	

*** = significant at 0.1% level, ** = significant at 1% level, * = significant at 5% level

Thus, the probability of participation was no higher for summer cottage owners in Iloantsi than for those in Joensuu.

As for the impact of age on participation, the coefficients suggested that the probability of participation was lowest amongst those over 60 years of age. One surprising result, however, was that age did not significantly affect the probability of participation.

Table 2. Groups of pickers in Joensuu based on the quantity of picked berries (litres) and number of berry-picking trips made per person in a household. Standardised values were used.

Picker group	n	Cluster centres	
		Amount picked	Trips made
I Active pickers	61	0.821	0.712
II Ordinary pickers	168	-0.433	-0.338
	Σ 229		
F-ratio		307.344	204.346
P-value		0.000	0.000

Table 4. Logistic regression model for the probability of belonging of households to the groups of berry pickers with different activity in Joensuu, active pickers =1. Coefficients (Wald statistics in parenthesis) and odds ratios (95% confidence interval, CI).

Independent variable	Coefficient (Wald)	Odds ratio (95% CI)
Constant	1.402* (6.400)	
Age		
age < 41	-1.491* (7.385)	0.23 (0.08;0.66)
age 41–60	-0.737 (2.646)	0.48 (0.20;1.16)
age > 60	Reference group	
Secondary school graduate	-0.109 (0.068)	0.90 (0.39;2.04)
Size of the family	-0.787*** (14.686)	0.46 (0.30;0.68)
Summer cottage available	0.672 (3.207)	1.96 (0.94;4.08)
Observations	214	
Log-likelihood	-99.34	
Chi-square	47.34	
Significance	0.000	
Observations correctly classified, %	78.97	

*** = significant at 0.1% level, ** = significant at 1% level, * = significant at 5% level

Table 3. Groups of pickers in Ilomantsi based on the quantity of picked berries (litres) and number of berry-picking trips made per person in a household. Standardised values were used.

Picker group	n	Cluster centres	
		Amount picked	Trips made
I Active pickers	46	0.550	0.744
II Ordinary pickers	125	-0.351	-0.400
	Σ 171		
F-ratio		213.950	256.562
P-value		0.000	0.000

Table 5. Logistic regression model for the probability of belonging of households to the groups of berry pickers with different activity in Ilomantsi, active pickers =1. Coefficients (Wald statistics in parenthesis) and odds ratios (95% confidence interval, CI).

Independent variable	Coefficient (Wald)	Odds ratio (95% CI)
Constant	0.998 (3.351)	
Age		
age < 41	-1.420* (5.834)	0.24 (0.08;0.77)
age 41–60	-0.699 (2.192)	0.50 (0.20;1.25)
age > 60	Reference group	
Secondary school graduate	-0.627 (0.589)	0.53 (0.11;2.65)
Size of the family	-0.512** (6.763)	0.60 (0.41;0.88)
Summer cottage available	0.326 (0.475)	1.39 (0.55;3.50)
Observations	148	
Log-likelihood	-73.49	
Chi-square	25.75	
Significance	0.000	
Observations correctly classified, %	73.65	

*** = significant at 0.1% level, ** = significant at 1% level, * = significant at 5% level

3.2 Groups of Pickers with Different Participation Activity Levels

In both municipalities there were two groups emerged with distinct differences in the activity of their participation (Tables 2 and 3). We termed the two groups ordinary pickers and active pickers on the basis of the cluster centres. Four Joensuu

respondents and one Ilomantsi respondent were excluded from our analysis because of either a missing or highly divergent value.

Factors affecting the probability of belonging to the groups of pickers with different levels of activity were similar for both municipalities (Tables 4 and 5). The probability of belonging to the group of active pickers increased with age

and declined with an increase in the family size. In this respect, compared to the model predicting the probability of participation, the effects of age and family size were the inverse of each other, even though the age coefficients were insignificant in the participation model. In both municipalities the odds on belonging to the active group of pickers improved more than fourfold amongst respondents over the age of 60 compared with those below the age of 40.

There were more younger families with children amongst the larger group, called ordinary pickers (Fig. 1). The bars represent the age distribution of all household members who participated in trips for berry-picking. In Joensuu the proportion of people below 50 years of age is clearly higher for the ordinary pickers than for the active pickers. In fact, if one excludes the high proportion of people in the 40–49 age-group, the age distribution of the ordinary pickers was rather similar to the actual age distribution of Joensuu inhabitants. In contrast, however, there were considerably more individuals in the 50–79 age-group amongst the active pickers. In the case of Iloimantsi, the proportion of people in the 30–39 age-group amongst the ordinary pickers was noticeably high, as, too, was the case for the 60–69 year-olds amongst the active pickers. Again, the ordinary pickers were clearly younger than the active pickers.

3.3 Patterns of Participation

The results of our logistic regression analysis indicated that the characteristics of the groups of pickers were quite similar for both municipalities. However, the differences in the patterns of participation were large. In Iloimantsi, both the active and the ordinary pickers picked more berries for home use than those in the corresponding groups in Joensuu (Fig 2). The differences were statistically significant. An even higher statistically significant difference prevailed as far as commercial picking was concerned amongst the active pickers. In neither municipality were the ordinary pickers actively picking berries for sale.

The Iloimantsi groups of pickers tended to go berry-picking roughly twice as frequently as the

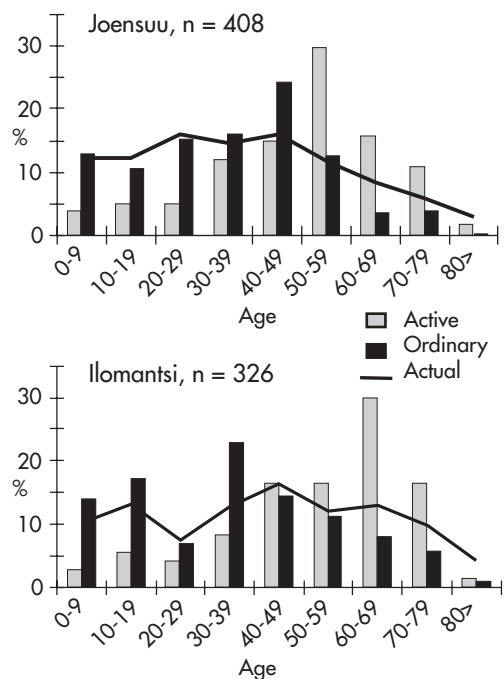


Figure 1. Age distributions of individuals involved in berry-picking according to the groups of pickers compared to the actual age-class distribution (Statistical yearbook... 1999) in Joensuu and Iloimantsi.

corresponding groups in Joensuu. In Joensuu the two groups made typical trips of about 30 km, and so the length of the primary berry-picking journey (including distance to a summer cottage) in a single direction was calculated on the basis of trips made in connection with lingonberry- and bilberry-picking.

4 Discussion and Conclusions

It was found that picking wild berries was a popular activity in both municipalities: in urban Joensuu 68% of all households and in Iloimantsi 82% did so. As a comparison, Salo (1984) reported that 73% of the Joensuu households picked wild berries in 1982. Analysis of the factors affecting participation suggested that differences in participation are most likely to be connected with

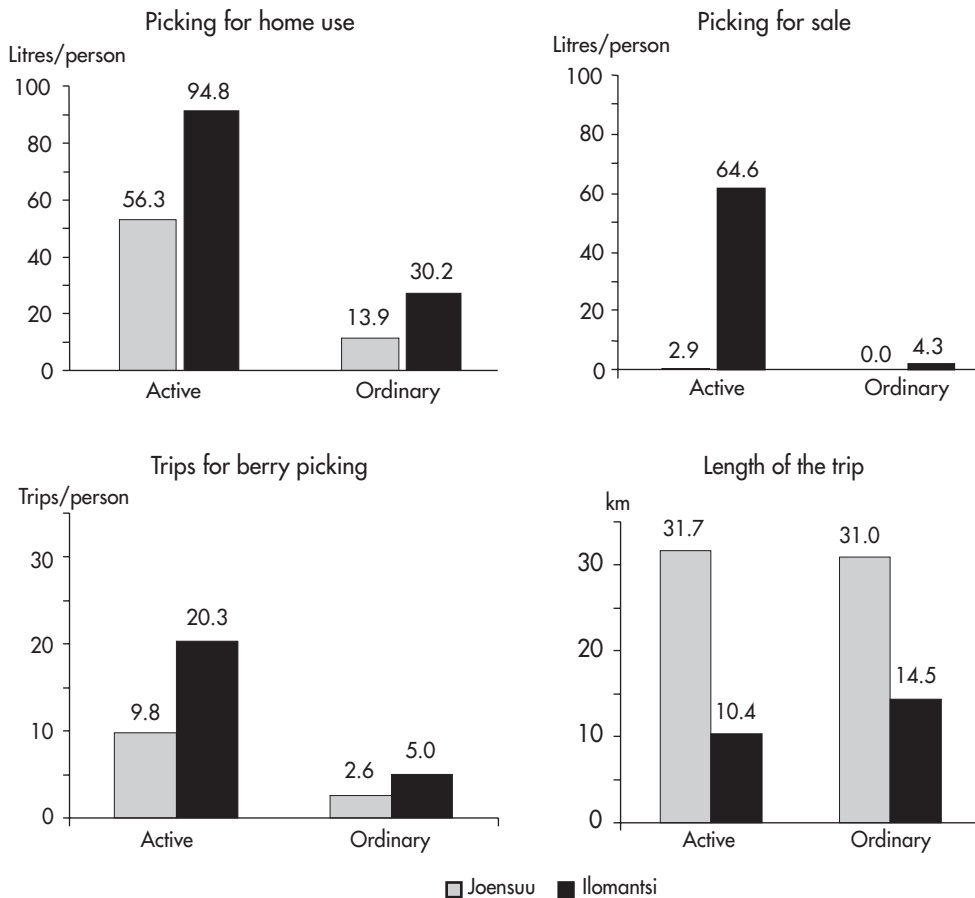


Figure 2. Quantities picked, trips made per person and the length of a typical berry picking trip for active and ordinary pickers.

constrained resource availability than with any unpopularity of the activity itself amongst urban dwellers. In other words, households situated in Iiomantsi did not significantly differ in terms of the probability of their participation compared with their equivalents in Joensuu who had access to a summer cottage. On the other hand, as far as Joensuu was concerned, the probability of participation was significantly higher for those who owned a summer cottage or had regular access to one than for those who did not.

The two groups under examination who did differ in the level of their participation were similar for both municipalities. The largest group, termed ordinary pickers, consisted of younger households than those of the active pickers, and

they tended to take their children along with them on their berry-picking trips. Combined with a relatively small difference in the participation rates for the rural and urban municipalities, this can be regarded as a promising factor for the future of berry-picking. If one adopts a life-cycle hypothesis rather than an age-class interpretation (Cheek and Burch 1976, Toivonen 1999) and if one takes into account the current age structure of the population, it may be that there will be even more active pickers in the future. However, no far-reaching projections can be made on the basis of results from a single year.

The differences between the participation rates and the characteristics of the various groups of pickers were not very large, but there were great

differences in the intensity of their participation. The Ilomantsi groups of pickers picked significantly larger quantities and undertook a larger number of trips in order to pick berries. Whether this is the result of a utilitarian relationship between people and nature in a rural area or whether it stems from other causes could not be solved by the present study. Nevertheless, picking appears to be highly valued by urban dwellers, since they needed to drive longer distances in order to reach the picking areas, even though they eventually picked smaller quantities per trip than their rural counterparts. On the basis of the results of this study, it would appear that participation in berry-picking is not crucially under threat, even though the distances to the resources are likely to increase and even though the utilisation rates of those resources are likely to decline.

Acknowledgements

The authors would like to thank the Academy of Finland (the Finnish Biodiversity Research Programme, FIBRE) and also the Graduate School in the Forest Sciences (as far as the first author is concerned) for their financial support. They are also grateful to Olli Saastamoinen, Jukka Matero, Anssi Niskanen, Heikki Pajuoja and two referees for their valuable comments, and to John A Stotesbury, who revised the language.

References

- Anderberg, M.R. 1973. Cluster analysis for applications. Academic press, New York. 358 p.
- Biological diversity in Norway. A country study. 1992. Directorate for Nature Management, Trondheim, DN-report 1992–5b. 112 p.
- Cheek, N.H. & Burch, W.R. 1976. The social organization of leisure in human society. Harper & Row, New York. 283 p.
- Dillman, D.A. 1991. The design and administration of mail surveys. *Annual Review of Sociology* 17: 225–249.
- Friluftsliv: en utredning fra miljøverndepartement. 1985. Miljøverndepartement, Oslo. 148 p. (In Norwegian.)
- Goyder, J. 1987. The silent minority: nonrespondents on sample surveys. Polity Press, Cambridge. 232 p.
- Hallikainen, V. 1998. The Finnish wilderness experience. Finnish Forest Research Institute, Research papers 711. Metsäntutkimuslaitoksen tiedonantoja 711. 288 p.
- Hay, M.J. & McConnell, K.E. 1979. An analysis of participation in nonconsumptive wildlife recreation. *Land Economics* 55(4): 460–471.
- Hosmer, D.W. & Lemeshow, S. 1989. Applied logistic regression. John Wiley & Sons, New York. 307 p.
- Hultman, S.-G. 1983. Hur mycket bär och svampar plockar vi egentligen? *Var föda* 35: 284–297. (In Swedish.)
- Kanuk, L. & Berenson, C. 1975. Mail surveys and response rates: a literature review. *Journal of Marketing Research* 12: 440–453.
- Kangas, J. & Niemeläinen, P. 1996. Opinion of forest owners and the public on forests and their use in Finland. *Scandinavian Journal of Forest Research* 11:269–280.
- Kangas, K. 2001. Wild berry utilisation and markets in Finland. D.Sc.(Agr. & For.) thesis summary. University of Joensuu, Faculty of Forestry, Research Notes 126. 43 p.
- Kujala, J. 1994. Kaupunkilaiset marjastajina. *Ympäristö ja terveys* 25(4): 38–41. (In Finnish.)
- Liikkanen, M., Pääkkönen, H., Toikka, A. & Hyytiäinen, P. 1993. Vapaa-aika numeroina 4. Liikunta, ulkoilu, järjestö- ja muu osallistuminen, loma, hovit. *Kulttuuri ja viestintä* 1993: 6. Tilastokeskus. Helsinki. 73 p. (In Finnish.)
- Maddala, G.S. 1983. Limited-dependent and qualitative variables in econometrics. Cambridge University Press, Cambridge. 401 p.
- Martin, C.L. 1994. The impact of topic interest on mail survey response behaviour. *Journal of the Market Research Society* 36: 327–338.
- Raatikainen, M. 1978. Puolukan sato, poiminta ja markkinointi Pihtiputaan kunnassa. Summary: The berry yield, picking, and marketing of *Vaccinium vitis-idaea* L. in the commune of Pihtipudas. *Silva Fennica* 12(2): 126–139.
- Rossi, E., Raatikainen, M., Huovinen, J., Koskela, M-L. & Niemelä, M. 1984. Luonnonmarjojen poiminta ja käyttö Väli-Suomessa. Summary: The picking and use of edible wild berries in Central Finland. *Silva Fennica* 18(3): 221–236.
- Saastamoinen, O. & Lohiniva S. 1989. Picking of wild berries and edible mushrooms in the Rovaniemi

- region of Finnish Lapland. *Silva Fennica* 23(3): 253–258.
- , Kangas, K. & Aho, H. 2000. The picking of wild berries in Finland in 1997 and 1998. *Scandinavian Journal of Forest Research* 15: 645–650.
- Salo, K. 1984. Joensuun ja Seinäjoen asukkaiden luonnonmarjojen ja sienten poiminta v 1982. Summary: The picking of wild berries and mushrooms by the inhabitants of Joensuu and Seinäjoki in 1982. *Folia Forestalia* 598. 21 p.
- 1985. Luonnonmarjojen ja sienten poiminta Suomussalmella ja eräissä Pohjois-Karjalan kunnissa. Summary: Wild-berry and edible-mushroom picking in Suomussalmi and in some North Karelian communes, Eastern Finland. *Folia Forestalia* 621. 30 p.
- Sievänen, T. 1993. Kaupunkiväestön ulkoilukäyttätyminen ja ulkoilualueiden käyttö. Hämeenlinnan ulkoilututkimus. Summary: Outdoor recreation household survey in the City of Hämeenlinna. *Folia Forestalia* 824. The Finnish Forest Research Institute, Helsinki. 62 p.
- Skogstatistisk årsbok 1998. 1998. Sveriges officiella statistik, Skogsstyrelsen, Jönköping. 347 p. (In Swedish.)
- Statistical Yearbook of Finland 1998. 1999. Official Statistics of Finland, Statistics Finland, Helsinki. 679 p.
- Toivonen, T. 1999. Empiirinen sosiaalitutkimus. Filosofia ja metodologia. WSOY, Porvoo. 447 p. (In Finnish.)
- Tyrväinen, L. & Väänänen, H. 1998. The economic value of urban forest amenities: an application of the contingent valuation method. *Landscape and Urban Planning* 43: 105–118.
- Ulkoilututkimus 1979. 1980. Sisäasiainministeriön ympäristönsuojeluosaston julkaisu C1 n:o 5. Helsinki. 45 p. + appendices. (In Finnish.)
- Walsh, R.G., John, K.H., McKean, J.R. & Hof, J.G. 1992. Effect of price on forecast of participation in fish and wildlife recreation: An aggregate demand model. *Journal of Leisure research* 24(2): 140–156.

Total of 30 references