CORVINUS UNIVERSITY OF BUDAPEST

Interdisciplinar

(Landscape Architecture and Decision Support Systems)

Doctoral School

THESIS OF THE DOCTORAL DISSERTATION

Possibilities of improve the iodine-supply in Hungary

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BUDAPEST
2007

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Landscape-Architecture and Decision Support Systems

Field: Interdisciplinary Agricultural Sciences

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1. INTRODUCTION

Many investigations present, that the iodine supply of majority of the Hungarian population is not sufficient on 80% of Hungary. The drinking waters contain less than 50μg iodine/litre, so the adequate quantity of iodine can not get into the human organisms. Two metabolic hormones (thyroxine and triiodothyronine) can not be synthetized in the body without iodine. This fact can cause many physiological symptoms and disfunctions around humans not just in Hungary, but worldwide also.

The iodine deficiency disorder might be mentioned as a very significant and actual one, since in 1990, 151 heads of state have signed the documents inside an ENSZ proposal, so as to eliminate the iodine deficiency worldwide. According to relevant data, about 1,5 billion people are suffering from iodine deficiency for the time being.

In accordance with WHO experts, more than 30% of the world population are living on iodine deficient areas, and the prevalance of iodine deficiency disorders reaches 80% in areas of severe iodine deficiency.

So elimination of iodine deficiency is a common aim, because generations, who grow up on iodine deficient areas may calculate with higher incidency of health-disfunctions. These can cause very negative limitations in the life-style, life-quality and sociological-economic activity of these citizens.

The list of the iodine deficiency disorders is the following:

- *Endemic goitre*
- *Endemic cretenism*
- *Retardation of growth*
- *Neonatal hypothyroidism*
- *High level of TSH at neonatal age*
- *Increased risk of abortion in the first and last trimester of pregnancy*
- *Increased risk of perinatal mortality*
- *Decreased level of mental and physical performance*
- *Disturbed fat, protein and carbohydrate metabolism*
- *Disturbed reproductive capacity both in men and women*

2. AIMS OF THE INVESTIGATIONS

1. What kind of effect has increase of the iodine supply on the quality and quantity parameters of animal origin food-products?

This point forms a very important one in my dissertation, specially because the Hungarian animal-husbandry is on one of the deepest level nowadays.

I have planned, organised, coordinated and evaluated iodine-investigations around turkies, diary goats and diary cows in order to:

- increase the meat-productivity;
- decrease the lethality;
- evaluate the effects of overdosing iodine;
- to produce higher iodine content milk;

Tha aim of my study with a limited animal-investigational and laboratorial background – was to focus on iodine-prevention, and to establish the utility of high iodine content of foddery and water.

The investigations have been carried out with the usage of Jódaqua (natural, mineral water), which has outstanding high iodine concentration. Among others, one of the advantage of the experiments was the usage of a natural, mineral water proved in human therapy, with high biological activity. This

means, that we were able to avoid the usage of not-natural, sinthetic additionals, which might have caused adverse effect onto the animals' organisms.

2. Firstly, I wanted to analyse the knowledge and attitude profile of the Hungarian society, with attention to consumption of micro-elements and of iodine supply. Secondly, how can a micro-element content product be put on the market, which could serve the complex-demands of the consumers to higher degree, than the present status.

At this part of my research I wanted to investigate different kind of available iodine content products, if how they serve the demands of the consumers. In order to do this, I tried to explore the role of product-attributes, in picture formed on the product utility by consumers.

3. I wanted to find an answer, if what sort of marketing measures could help the development of iodine prevention of the Hungarian population?

The third aim of my research was to create a prevention-communication plan, that aimed – using governmental resources in theory - to execute the Hungarian iodine prevention program. In my work I aspired to follow the suggested prevention strategy trends of international organizations (WHO, FAO, UNICEF, ICCIDD) and Hungarian Iodine Committee recommendations. During my work I have given special attention for planning information system of the society with as complex way as it possible.

The main purpose of this step in my research was to create a communication-strategy, which can be used not just in theory but in practice too.

The earlier written three points are in close coherency. It is entirely obvious, that the increase of the iodine content of the animal origin food-industrial products could help the iodine supply of the society. It is clear also, that the proper knowledge level of the society is the most effective way in order to execute radical iodine-prophylaxis marketing strategy.

I tried to realise my work according to general and long-term statements concerning with iodine supply and iodine prevention, supported with comprehensive professional literature background.

The importance of iodine supplementation in animal foddery

Every animal, who has goitre organ, the iodine-supply of the body is extremely important, due to the synthesis of the two, earlier introduced metabolic hormones. One of the main goals of my scientific literature research was to get as many informations about the importance of iodine as it possible concerning with the animal-foddery. I have given special attention to the scope of countries (USA, Great-Brittain, Germany), which have executed iodine-prevention program amongst others via high iodine content foodstuffs (bakery products, milk, oil, salt), avoiding medicinal products and their chemical alternatives.

It is worth noting, that all the therapeutical costs of treatment of the iodine deficiency disorders exceeds 1 billion US dollars in Germany.

In a German doctoral dissertation it is clearly proved, that there is a close coherency between the iodine content of the cows' urine and the iodine content of the cows' milk. It is summarised, that the higher iodine content

animal origin food-industrial products can play an important role in the human iodine prevention.

3. MATERIALS AND METHODS

The first turkey investigation

The investigation has been carried out together with the Bábolna RT. at Mocsa, accoding to the number 260/2002 permission of Animal Sanitary and Food Institute of Komárom-Esztergom county. The turkey investigation has been run for 49 days long. The young turkies have been divided into four groups in order to have male/female and control groups..

Jódaqua was given to the turkies in the following study days: 2., 3., 9., 10., 16., 17., 23., 24., 30., 31., 37., 37., 38., 44., 45. nap. Between days 2-31. 3 ml/50 bodymass kilogram/day, from day 31. 2 ml/50 bodymass kilogram/day Jódaqua® was given to the drinking water of the turkeys. The feeding, the drinking, the heating, the ventillating and the animal-health service was the same in all of the four groups.

The second turkey investigation

The investigation has been carried out again together with the Bábolna RT. at Mocsa. Three turkey-stables have taken part in the study. For this experiment we got the permit from the Agricultural Ministry as a plus. The 6000 pieces of male and the 5000 pieces of female Turkies - which have taken part in the experiment as the treated group - were imported from France, and have been kept in different stable but in one air-space. The control group – 11 000 pieces of male and 12 000 pieces of female turkey – have been kept in other two stables. The Jódaqua® drinking was on the following days: 2., 3., 7., 8., 14., 15., 21., 22., 28., 29., 35. és 36. The Jódaqua® quantity mixing into the drinking water until the 29th day was 3ml/50 bodyweight-kilogramm, than 2 ml/50 bodyweight-kilogram. The determination of the Jódaqua quantity to be drank was made by average of representative turkey bodyweight measuring (100 pieces of turkey/stable).

Investigation with milking cows

According to the scientific literature's data the 70-90% of the iodine requirement of the milking cows is covered by the foddery. This resorbtion realising from three different part of the cows' stomach. It looked obvious, that with the increasing the foddery's iodine content, we could obtain higher iodine content milk eventually.

Summary of the cow investigation

The study took place in Sármellék in Zala county (iodine deficient area). The 71 milking cows (type Magyar tarka and Holstein-fríz) – owned by the Petőfi Agricultural Organisation – have been supplemented with iodine content mineral water Jódaqua between 03.03.2004 and 07.04.2007. The main aim of investigation was to increase the iodine content of the milk, which than can used for human iodine prevention.

Again, Jodaqua – high iodine content natural mineral water – was mixed to the foddery of the cows two times daily in the mornings and in the evenings.

The feeding of the cows was realised by corn/soya mixture, corn silage and Salvamin Mast 309. The quantity of Jódaqua was 2 litres in the morning and 2 litres in the evening, which means approximately 5 mg iodine supplement to the cows' foddery per day per animal.

During the four week long experiment, samples have been taken from the total milk quantity on each 7. day. The samples were analysed in the Chemical-Toxicological Laboratorium of Fodor József National Institute of Public Health.

Investigation with questionnaires around citizens

To have deeper understanding of the society's knowledge and oppinion about the micro-element intake and healthy nutrition, I have carried out an investigation with questionnaire with a direct question survey method. Totally 250 person have taken part in the work and they mainly came from the capital. The questionnaire contained 48 pieces of Likert-scala questions and two „which to chose" questions. At the Likert-scala questions the respondents had to decide how much did they agree with the statements from 1 to 5. If the statement totally met with the oppinion of the respondents, then they had to mark 5, if the oppinion was totally against the statement, then they had to mark 1. The investigated population was totally from the capital, which might be understood, that the graduation level, the qualification and the knowledge was far over the Hungarian average level. Generally speaking we can say, that the earlier mentioned aspects are much higher level in Budapest, as in other under privileged part of the country.

This first questionnaire – although the population was not social composition – showed very useful and important aspects for me, and these can be used for the aims of my dissertation.

In the second wave of the direct question survey investigation I tried to have more complex social composition of the respondents. Broadly speaking to have informations not just from Budapest, but from other part of the country, which could be avaluated later as a more representative picture.

The missing financial background did not allow me to have more representativ and more effective investigation. But I must say, that although the study had many weak points due to the sampling, many important informations have been collected, which made my work more valuable.

Conjoint analysis

In the second part of my research I used the conjoint analysy to find optimal balance among product-attributes. 90 person have taken part in the conjoint analysis, which was mainly an explorative method, so the whole national representative survey was not aimed and in a such manner obtained.

The meaning of conjoint analysis is the following: different kind of products are created by an „ortogonal positioning" with the help of product-attributes. Because a product can be presented with unlimited much of attributes, the conjoint-analysis of course – in this understanding – means a strong simplification, due to the very few focused attributes number.

During my investigation I have created 6 product-attributes and 14 attributes-level. The purposed product was obviously a product, which is to optimize the iodine level of the human organism.

For the computer-evaluating I used conjoint adsoftware of the SPSS software package. With the help of this software I determined the utilities of the product-attributes, and from these data the total-utility was determined for the different kind of products.
The results give a very good basis for the further-improvement of the prevention-strategy.

The focus-group interviews

During my work I have made three focus-group interview. Although the place of the interviews was in Budapest, the respondents were coming from different places of Hungary.
The spoken interviews have been recorded, then the sound-materials have been analysed by the Atlas.ti content-analisator software. Via this step the most important points of the conversations can selected and found.
With using the focus-group interview I also tried to look for answer, that how often the keywords appereance in the talk of the respondents, which are in a close correlation with the iodine-supply. This method allowed me to create a matrix, that summarized the product-attributes, which were mentioned during each interview. This matrix was analysed by the Ucinet 5.0 software package.

Laddering

The iodine-supply has a very unique place in the mind of the consumers, and therefore I had to use very special research methods. One of these was the laddering.
Laddering has been used in psyhology for long time and from the early 1980s more and more cases in marketing-research.
Meanwhile the method was developing further to the version: Means and Chain analysis - MEC modell. According to Gutman (1982) this method means, that the means might be things, objects (for example products), or activity, that is connected to people. In this understanding the goals are human feelings like hapiness, feeling safe or self-realising. The aim of the MEC modell is to give answer for the question: what is the correlation between the chosen of one product (why exactly that product was bought?) and the desired goal, which can be reached by the buying of that product. So the MEC modell look for relationship among exact product-attributes, usage-value and the personal value of the consumers. So the result is a hierarchical Value Map, which demonstrate the relationship among attributes, the consequences and personal values. We can get a tree-like figure, which presents visually the relationship between the exact and abstract values.
With a view to the greater visual effects the main consequences, which can be obtained with the help of the three interview, can be seen on the 5. Figure.

4. RESULTS

Results of the first turkey investigation

The turkey investigation at Mocsa has convincingly shown, that iodine supplement has very powerful and useful effect onto the physiological processes, health status of the turkies. Due to the metabolic optimalizing and roboral effect of iodine the animals' bodyweight – having the same quality and of foddery – showed larger gain matching with the controll group. Beside this fact the lethality percents of the animals took part in the investigation decreased significally!

Table 1.: Effects of Iodine supplement onto the lethality and bodyweight parameters of male turkies

Age of turkeies (day)	Male turkies			
	1. stable		2. stable	
	Treated group		Control group	
	Lethality (%)	Bodyweight (g)	Lethality (%)	Bodyweight (g)
8	1,91	184	2,05	161
14	2,54	345	2,87	318
22	3,42	676	3,69	646
29	3,69	1111	3,93	1039
35	3,75	1559	4,03	1438
42	3,79	2318	4,12	2208
49	3,93	3113	4,34	3005

In case of male-turkies it can be seen, that till the end of the 49. day the bodyweight gained 85 g per animal in comparison to control group. This means that from the aspects of the total animal number (8454 animals) the plus bodyweight increase was 718,59 kg. The lethalitiy was better than the controll group by 0,41%, which gives plus 112 kg in turkey weight. Together, the two earlier mentioned increases means 830 kg additional bodyweight in case of the male animals compared to control.

In the following table the female turkies' results are demonstrated.

Table 2.: Effects of Iodine supplementation onto the lethality and bodyweight parameters of female turkeies

Age of the turkeies (day)	Female turkies			
	4. stable		3. stable	
	Treated group		Control group	
	Lethality (%)	Bodyweight (g)	Lethality (%)	Bodyweight (g)
8.	2,43	150	2,47	165
14.	3,07	290	2,98	320
22.	3,61	589	3,57	597
29.	3,76	935	3,69	982
35.	3,77	1384	3,71	1356
42.	3,85	2038	3,75	2078
49.	3,88	2707	3,82	2682

In case of the female turkies – matching to the male ones – we have not obtained similar solid results, since till the end of the 49. day only 40 g bodyweight was excess per turkey for control group. For the total animal number (8305) this value reached 322,2 kg bodyweight. Surprising fact was, that the lethality percents were worse at the treated group, than at the control group by 0,07%. In all, the two earlier mentioned numbers means 315,9 kg more bodyweight excess in case of female ones in comparison to control group.

Summarising the two tables (1 and 2) at the end of the 49 days long experiment we can report the followings: totally 1146 kg bodyweight increase has been obtained with iodine supplement.

It is important to remark, that there was no posibility to measure the quantity of the feeded foddery, so we did not get informations about the utilisation of the foddery per animal. Probably, it could have been better in the treated groups.

Summarizing the first turkey investigation we can state, that iodine supplement has absolutely positive effects onto the production-parameters of turkies. This means, that the turkey sector in Hungary could reach much higher production output with using iodine supplement at the input side!

Results of the second turkey investigation

The outstanding good results of the first investigation, we started the second one approximately with same facilities to have more informations concerning the iodine effects onto the bodyweight and lethality numbers of turkeies. The only differents between the first and the second incvestigation was, that the

duration of the treatment was only 42 day long, instead of 45 day and the animal number was also less, than in the previous investigation.

After evaluating the data, we can state, that average 122 g body weight excess was reached in case of male turkies, and 8 g bodyweight one in case of female ones in comparing control. At the same time, the lethality percent decreased by 5,76% in case of the male and 3,34% in case of female turkeies matching them to the control group. It was obvious, that the bodyweight gain was much better in case of male turkeies, than in the first investigation, moreover the lethality percents decreased either. It is interesting, that the values of bodyweight was not so high as it was in the first investigation in case of females. Outstanding results was, that the lethalitiy percents of the female turkeies showed much better level, than in the first study. So summerizing the whole second study a very solid gaining investigation has been carried out, which underlines the importance of iodine in the turkey physiology and utility in foddery.

In the light of the recent Hungarian turkey-meat consumption, we can say, that the bigger demand on the turkey product can be useful from the aspects of healthy nourishment, due to the positive effects of low-fat content, white-turkey-meat.

Results of the milking-cow investigation

For one month period we have mixed milking cows drink high iodine content mineral water into the foddery of the milking cows. The larger animal population allowed us to have more exact results. The results of the four week long study (one week before and one week after the investigation one-one sample taking was carried out also) can be seen on the following figure:

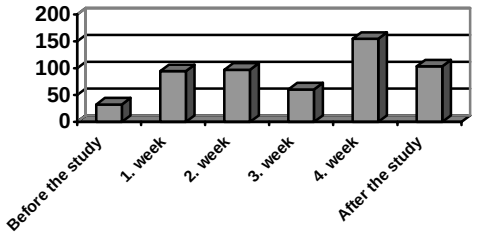

Figure 1.: The iodine content of the milk samples before, during and after the investigation [µg jód/100g minta]

The measured results shows significant changing in the iodine concentration of the milk samples. The iodine content of the milk has significantly increased at the end of the 4th week in comparison to starting value before the study. Moreover after the study – already without the usage of Jódaqua – the iodine content of the milk sample was still higher, than it was before the process. On the third week the little lower iodine content could be explained with the not appropriate sample-taking. In the same time we must say, that although the level of iodine was lower in the milk on the third week, than in the first, and second week, the iodine quantity was still two times higher, than before the study. Moreover the iodine content on the fourth week shows again solid increasing, which means that the iodine content on the third week was not due to cow-physiological reasons.

Summarizing the study made around milking cows we can say the followings: we could increase the iodine content of the milk without any inconveniances in the milk-production of the cows. The iodine rich milk – a earlier mentioned – is a very useful and proved method to eliminate the human iodine deficiency in such countries like Hungary, where the soil and water, consequently the food chain is extremely poor in iodine.

Results of the direct questionnaire survey

During my investigations I was looking for the answer, if how deep is the knowledge of Hungarian consumers on the micro-element intake discipline. The questionnaire with the average numbers and the standard deviation can be seen ont he following table 3.:

Table 3.: Attitudes of the respondents concerning with the statements

Statement	Average	Standard deviation
I eat much vegetable and fruit, so I need not be afraid from the vitamin or mineral deficiency.	3,42	1,02
Our parents and grand-parents did not give so big attention to the healthy nourishment, although they were much more healthier than us.	3,40	1,17
I feel tired and unmotivated often.	3,49	1,12
I'm sensitive for the wheather-changings.	2,41	1,41
The main obstacle of the healthy nutrition in Hungary is, that Hungarian people do not know what should they give attention to.	3,40	1,29
Around my friends there are a lot of who are suffering from depression.	2,58	1,29
People in my environment do not give proper attention to the role of healthy nutrition.	3,52	1,03
The main obstacle of the healthy nutrition in Hungary is, that the people do not have enough money for that.	2,95	1,43
I do not have time to think in these regards.	2,62	1,30
I'm afraid of everything, which is not natural, I think, that we shouldn't make so radical and deep steps against nature	3,13	1,27
Many times it is difficult for me to concentrate	3,01	1,18
My nutrition is optimal for energy-intake	2,79	1,32
My nutrition is optimal for Calcium-intake	2,62	1,23
My nutrition is optimal for Vitamin C-intake	3,35	1,37
My nutrition is optimal for fat-solubil vitamins	2,45	1,26
My nutrition is optimal for Magnesium-intake	2,38	1,23
My nutrition is optimal for micro-element intake	2,62	1,36

The study proved, that the respondents showed very high level of incertitude from more aspects. Moreover it was very shocking, that even this higher educated, well-posted, young group of the society had only very incomplete information about the importance and role of the micro-elements and vitamins concerning with nutrition and health. Worthy of noting, that how big was the number of persons, who in most cases disapproved the relevance of healthy nourishment. Thought-provoking, that high ratio of the respondents felt themselves tired and depressed - beside this - many people thought, that the main obstacle of healthy nutrition is because „people do not know what should they pay attention to". Furthermore, fair number of the answerers agreed with the statement, that people in their environment care only a little bit for the healthy nutrition. It was evident, that the question „What is your stand-point about yourself concerning with the healthy nutrition" couldn't have been asked, but asking about the environment gave more realistic and more valuable data, because it is much preferable for everyone to give informations about others instead of himself. In many cases we got disparate answers from the expected one. For example, the ratio of people, who have fears from not natural, sinthetic products was very low. Probably this menthality means, that one part of the Hungarian society is still underdeveloped and uninterested from the aspects of healthy nutrition. Only a few respondents adjudge optimal their own nutrition from even any aspects.

Principally vitamin C uptake was the only one, whereof they had direct informations, probably because of the frequent and powerful printed or electronic media effects. Worthy of noting again, that there was no proper

capacity and attitude concerning with the – extremely big physiological effect - fat soluble vitamins, micro-elements or even magnesium.

So we can get sorrowful data, that how big is the insufficiency in the consumers' knowledge about the healt-status, that could be reached via nutrition and supplementation.

In the next part of my investigations I determined seven different kind of points, which could provide for us to have better condition and have healthier life-style.

The task for the respondents was to stand up a rank from 1 to 7 in such a way, which is the most and which is the less important for reaching the goal.

Table 4.: The average rank numbers according to the respondents oppinion

Point of view	**Average**
Complex nutrition	2,72
Usage of different kind of food-supplements	6,22
Active life, regular exercise	1,95
Keep off fatty and high cholesterol content food-stuffs	4,25
Everyday fruit consumption	2,88
Supplementing the nutrition with vitamin C casually	4,61
Supplementing the nutrition with multi-vitamin and/or mineral products	5,31

My investigations proved, that majority of the respondents assign heavy importance to the active lifestyle, to the regular physical exercise, for the complex, vitamin-rich nourishment and the everyday fruit consumption.

Evaluating the data we can say, that the respondents generally understand, what should they do for the healthy nutrition but in the practice they can not realise it, as the following part will show it in the questionnaire.

The next question in my survey wanted to know, if which factor is the most important, second, third, fourth and fifth most important for the consumers, when buying a new food-supplement.

Table 5.: Average values of ranking list of the product-factor's importance according to the consumers

Factor	Average
Price	2,91
Thrustability	4,05
Name of the producer	2,89
How long will quantity be enough	2,76
Composition	4,20

The most important factor for the consumers – as it can be seen in the table – is the composition, content of the product. Compairing to this, the price – although it is still very important - is only at the second place. At the same time great importance was showed into the thrustability's direction.

During my work I tried to find answer for the question, if which information-channel is used most frequently for knowing a new food-supplement.

Table 6.: táblázat: Information channels used most frequently by the consumers

Information channel	Average	Standard deviation
Family doctor	1,94	1,26
Specialist	1,95	1,27
Tv, radio, advertising	4,17	1,25
Pharmacist	2,39	1,43
Commercial vendor	1,73	1,11
Friend, relatives	3,13	1,46

Media is having outstanding key role among the others. The second place went to the friend and relatives. It was interesting, that the medical advice

reached only the last two places. This probably means, that the suggestion of doctors do not have such an effect, which lead consumers to shops for buying.

At the end of my direct question survey, I tried to find out, that what the Hungarian consumers think about their own knowledge concerning with basic idioms of the micro-element intake and healthy nutrition. In this case four kind of answer posibilities could be chosen, a sin the table below can be seen!

For example in case of the iodine-deficiency question – despite of the high qualification – many „I do not know" type answer arrived. Nearly 50% of them did not know what the hyper-vitaminisation means. In case of vitamin C this number was 30%. The further question about the basic idioms of the nutrition were also not in the top of the known regards. The high numbers in the two last columns of the 7. table shows, that the Hungarian population does not comprehend the importance of the food-stuffs, and the contents of them.

Table 7.: Knowledge of the basic idioms concerning nutrition in %

	Much or less I know	I pay attention to it	I do not know, but I'm not interested in it	I do not know, but I would be interested in it
Iodine deficiency	23,1	10,4	31,5	34,9
Iodine overdosing	59,8	6,9	20,5	12,8
Vitamin overdosing	35,0	12,8	21,4	30,8
Vitamin C	49,6	20,5	12,0	17,9
Magnesium	59,8	20,3	8,3	11,6
Iron	54,7	20,5	14,5	10,3
Calcium	53,8	27,4	8,5	10,3
Calory intake	65,0	24,8	6,0	4,2
Micro-element	45,3	25,6	19,7	9,4
Hyper-vitaminisation	34,2	18,8	20,5	26,5
Iron deficiency	15,4	5,1	35	44,5
Metabolism	56,4	19,7	9,4	14,5

Generally speaking we can say, that this survey demonstrated a very sorroful picture relating to the general knowledge of the consumers. The nutrition revolution in brains can not be imagined without a strong and complex governmental support, due to the very apatic and not motivated Hungarian society.

In the next step of my research I tried to look for coherencies among the followings: is it possible to determine samples or thinking directions in the oppinion-creation of the consumers according to the level of their harmonisation with the statements? My calculations – concerning with the above mentioned regard – was made by using variant, measured on the intervallum-scale of the main-component-analysis method. This method has been known as categorical principal component analysis (CPCA) by the relevant literature. The more developed versions of the SPSS software-package able to execute this task. With the result of the method, it is possible to separate four kind of main-component. The certain main-components are demonstrated in the 8. table. In order to have better perspicuity I represented only the main-component values, which were above 0,3 absolute value. For the better identification I gave fantasy names for the certain main-components.

Graphically it marks out from the table, that in the first main-component those statements got high main-component values, which emphasize the importance of healthy nutrition. Nevertheless they are on the standpoint also, that it is sufficient for the healthy life-style to have complex nourishment.

In the second main-component those statements got important role, which – opposite to the first component – did not acknowledge the importance of the

proper nutrition and did not acknowledge the connection between the nutrition and the health-status. In the third main-component those statements got roles, which gave the biggest attention for foodstuffs made by modern-technology relating to the health-status. At the fourth main-component, those statements got role, which gave importance for products of natural origin.

Table 8.: Results of the main-component analysis

Statement	naiv inquiry	Apatic	Technokratic	Natural way focused
I eat much vegetable and fruit, so I need not be afraid from the vitamin or mineral deficiency.	0,874	-0,548		
Our parents and grand-parents did not pay so big attention to the healthy nourishment, although they were much more healthier than us**.**		0,745	-0,611	
The main obstacle of the healthy nutrition in Hungary is, that Hungarian people do not know what should they pay attention to.			0,429	0,548
The main obstacle of the healthy nutrition in Hungary is, that the people do not have enough money for it.			0,711	0,547
I do not have time to think in these regards.		0,648	-0,544	-0,487
I'm afraid of everything, which is not natural, I think, that we shouldn't make so radical and deep steps against nature	0,487			0,744
I do not have enough money for the foodstuffs, which I think, can be more useful for my health.	0,455		0,431	0,328
Most of my friend having savings on the nourishment.			0,418	
I have enough problem in my life, I do not have more capacity to deal with these regards.		0,641	-0,348	
I pay attention for having my complex nutrition.	0,478		0,381	
If somebody wants to keep him/herself healthy, he must sacrifice money for the nutrition.	0,471		0,354	
I believe in modern medical sciences, so I buy food-supplements often.			0,488	-0,439
I think, if somebody has complex nutrition, to do exercises and avoid bad habbits, there is no need to take additional tablets	0,471			
I'm afraid of the side-effects of medicinal products				0,742
I'm interested in the new results of modern medical- and nutrition sciences			0,412	
If I get good informations from a product, I try to test it personally	0,458		0,651	0,54

According to the main-component-analysis's results four main component values were ordered for every respondents. According to these values there is possibility to carry out the cluster analysis. As we know, there is no definite method to calculate, that how many cluster would be optimal during the cluster-analysis. The cluster-analysis was made to 2-10 clusters. For professional reasons I found to create 4 factor as an optimal situation. The name of the clusters was the same, which was used for the main-component analysis.

Table 9.: Results of the cluster analysis

Statement	naiv inquiry	apatic	technokratic	Natural way focused
I eat much vegetable and fruit, so I need not be afraid from the vitamin or mineral deficiency.	4,05	2,1	3,467	3,41

Our parents and grand-parents did not pay so big attention to the healthy nourishment, although they were much more healthier than us**.**	3,41	4,1	2,41	3,12
The main obstacle of the healthy nutrition in Hungary is, that Hungarian people do not know what should they pay attention.	3,15	3,1	3,87	3,61
People in my environment do not give special attention to the nutrition.	3,28	3,87	3,18	3,07
The main obstacle of the healthy nutrition in Hungary is, that the people do not have enough money for it.	4,21	4,63	4,15	4,54
I do not have time to think about these regards.	3,12	4,21	2,58	2,43
I'm afraid of everything, which is not natural.	3,54	3,15	2,45	4,24
I do not have enough money for the foodstuffs, which I think, can be more useful for my health.	4,25	4,25	3,68	3,85
Most of my friend having savings on the nourishment.	3,48	4,37	3,68	3,58
I have enough problem in my life, so I do not have more capacity to deal with these regards	2,57	4,11	2,26	2,26
I pay attention to proper nutrition.	4,01	3,31	4,01	3,947
If somebody wants to keep him/herself healthy, he must sacrifice money for the	4,65	3,78	4,26	4,55
I believe in modern medical sciences, so I buy food-supplementers often.	3,56	3,02	4,21	3,31
I think, if somebody has complex nutrition, to do exercises and avoid bad habbits, there is no need to take additional tablets	4,58	3,45	3,65	3,98
I'm afraid of the side-effects of medicines and food-supplementers	4,21	3,56	3,87	4,36
I'm interested in the new results of medical and nutrition sciences.	3,45	3,14	3,88	3,36
I always try the new food-industrial products	4,02	3,57	4,33	3,68
If I get good informations from a product, I try to try to test it personally	3,84	3,51	4,25	3,65

Respondents who were in the clusters show often socio-demografic differents. So it was easy to determine the main characteristic of the persons forming clusters. The socio-demografic characteristics can be seen in the table 10. below.

Table 10.: The charactheristic of the respondents

	naiv inquiry	Apatic	Technokratic	Natural way focused
The socio-demografic characteristic of the respondents	„Average-consumer" between 35-59 years, live in Budapest or in bigger countryside town, the highest education is the secondary-school graduation, do not trade with the food-production, cooks at home and buys food regularly	Under the age of 45, live in Budapest or in big city, highest education secondary school graduation, cook and buy food very seldom, male	Between the age of 18-45, middle or high level education in nature sciences, live in Budapest or in town, male	Over the age of 45, middle or high level education, live in countryside in village, have higher income than the average, have secondary school graduation at least
Main information-channel	Television, printed media	Popular media	Internet	Internet, Television, Radio

Evaluating the table it can easily be seen, that the higher educated respondents give more importance for the nutrition. They are the population, who recognize, that to have complex, balanced nourishment is not more enough, but it is strongly adviced to use some kind of food-supplementer alternatives.

It was an other interesting moment, that in the first place the women, who believe, that important thing is to use rather natural food-supplements. At the same time the older, higher educated, male population accepted rather the synthetic food-supplementers. This differention is easy to support with the well-known scientific theory, that women are much more sensitive for the potential dangerouses.

Conjoint analysis

Paralell to the direct question survey I have carried out an earlier demonstrated – so called conjoint analysis - method, which was made to

- create an iodine content product, that can optimizing the iodine level of the body
- create a marketing strategy, which can help for the better positioning of a new iodine content product ont he market

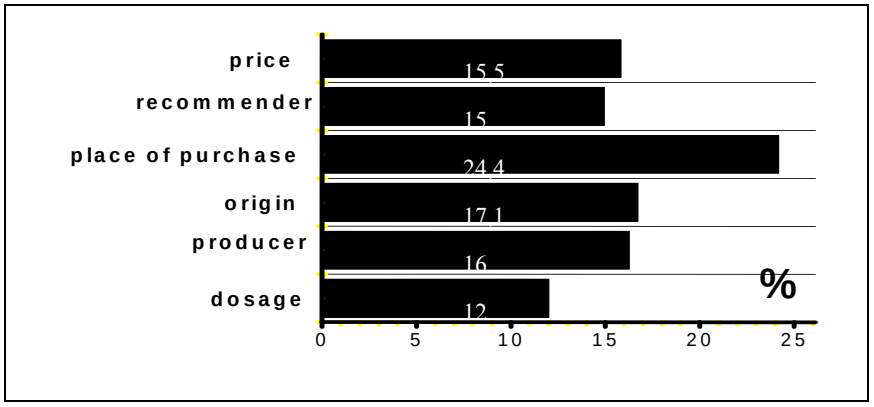

Figure 2. The relative importance of the factors to reach maximum level of the utility-function

With the help of analysed attributes and co-attribute-level values we can have a complex overlook for the conditions of the optimal product formation.

Formulation: - 0,1768, tablet form +0,1768, liquid form

Producer: - 0,2712, if domestic +0,2712, in case of multi

Origin: -0,8095, in case of sinthetic +0,8095, in case of natural

Place of purchase: pharmacy -0,022

bio-shop -0,022

any retail trade +0,363

Suggestion: -0,1921, in case of no suggestion +0,1921, in case of doctor

Price: 1 unit -0,408

1,2 unit -0,816

1,4 unit -1,223

The certain values means the index numbers of the utility function. The level of the numbers can be defined as the favorable and infavorable effects onto the single factors.

The following utilities could be determined by using the edification of conjoint analysis: in connection of Jódaqua used int he investigation with outstanding physiologic effect;

+	–
Liquid (0, 176)	Not very good known producer (0, 274)
Natural (0, 270)	No medical recommendation (0, 192)
Can be sold anywhere (0, 363)	
Cheap (1, 224)	

In the light of the above mentioned data for the distributor of Jódaqua mineral water the following marketing activity should be targeted and effected:

- To build image onto the extant strengthness
- Commercial introduction and distribution, namely, to use the optimal combination of push-in and push-out strategies

Results of the focus-group investigations

With the help of the matrix-analysator software, I get the possibility to find the parallelity and similarity among certain attributes by using the multi-dimensional scaling. In this way the certain attributes – due to the interaction among each others – can be illustrated in two dimensional flatness.

The results can be made more visual and more effective, if we illustrate the relevant data – relating to the attributes – with the NetDraw software package. The made graph is demonstrated on the 3. Figure. The strengthness of coherencies among the attributes symbolised by the grossness of the connecting lines.

It can be seen clearly from the figure, that the coherency between certain factors is stronger, on another occasion the coherency between others is weaker. This means, that some factors are often mentioned together. With regard to this typical examples were the natural-origin and natural flavour or cheapness and „easy to dosage" factors.

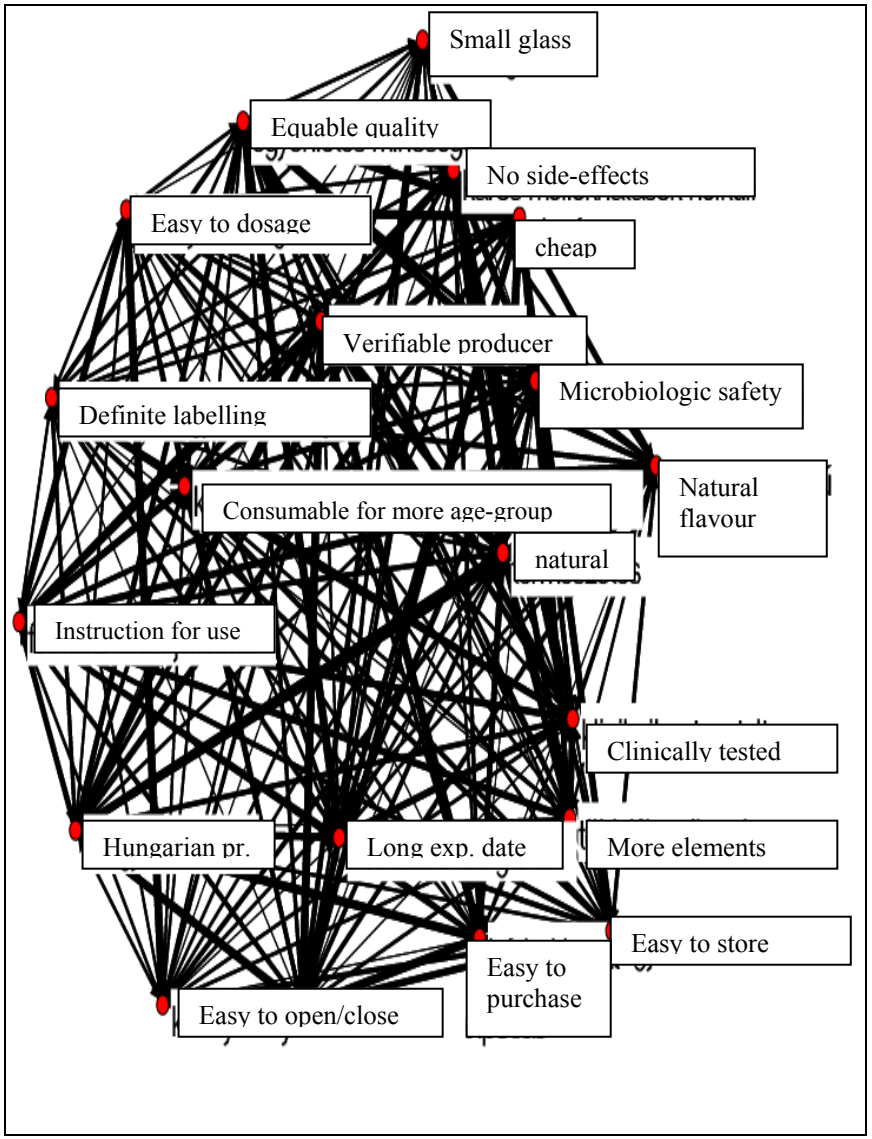

Figure 3.: The grafical visualisation among the investigated attributes with the Netdraw matrix-analysator software

For the better visual effects I investigated the attributes' relationship with the multidimensional-scaling too. The results of the calculation summarized on Figure 4. The Figure was made in a such matter, that the diameters of the red circles shall be in ratio with the incidence rate of the attributes' references.

It is easy to realize on the figure, that if I illustrate the results in two-dimensional flatness all of the four flatness-quarters have attributes. In the first flatness-quarter the „natural", the „no side effects" and the „Hungarian made" aspects got the greatest importance. In the second one, mainly the product's price/value aspects got importance. The third one unifies the practical and functional aspects of the product and the fourth quarter summarised the safety parameters.

Eventually, we can state, that the visualisation of the multi-dimensional-scaling demonstrate properly the expectations-matrix of the consumers. This confirms and emphasises, the elemental importance of the natural-origin and place of origin of the products.

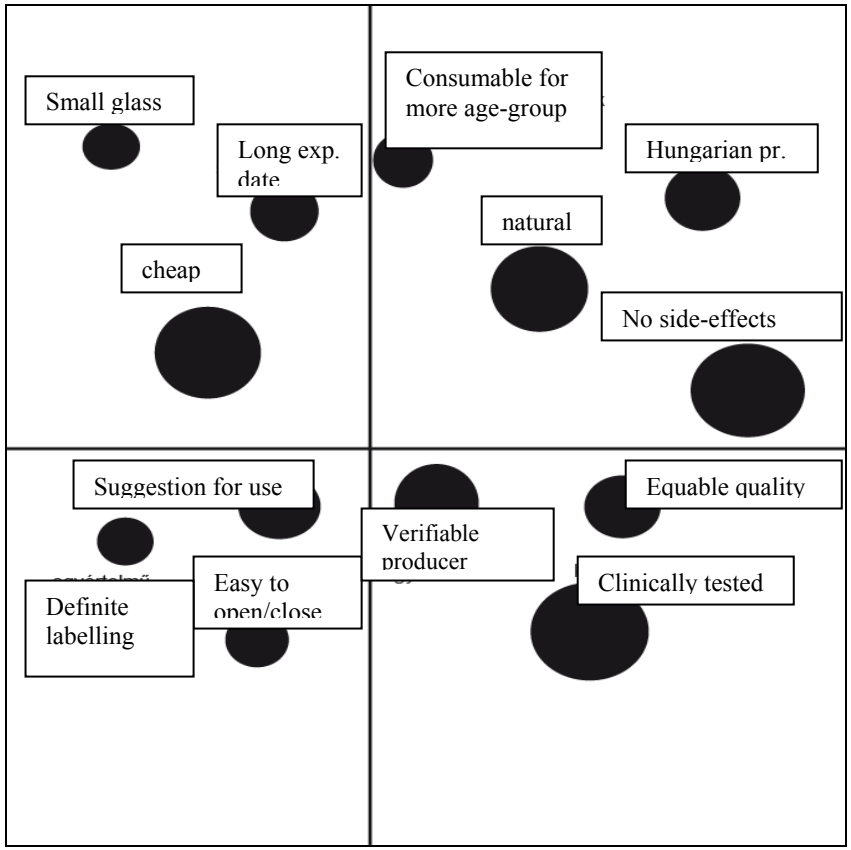

Figure 4.: Positioning of the product-attributes with using the multi-dimensional scaling

In the next part of my research I have disposed – with the method of laddering – a calculation so as to get answer for the following What attributes and especially general human values can be connected to different product-features.

This research supports the fact, that laddering can be used with a great effectiveness to discover relationship-net among product-attributes and human-values. It can be seen from the result also, that the consumers associate various kinds of the values to concrete product-attributes.

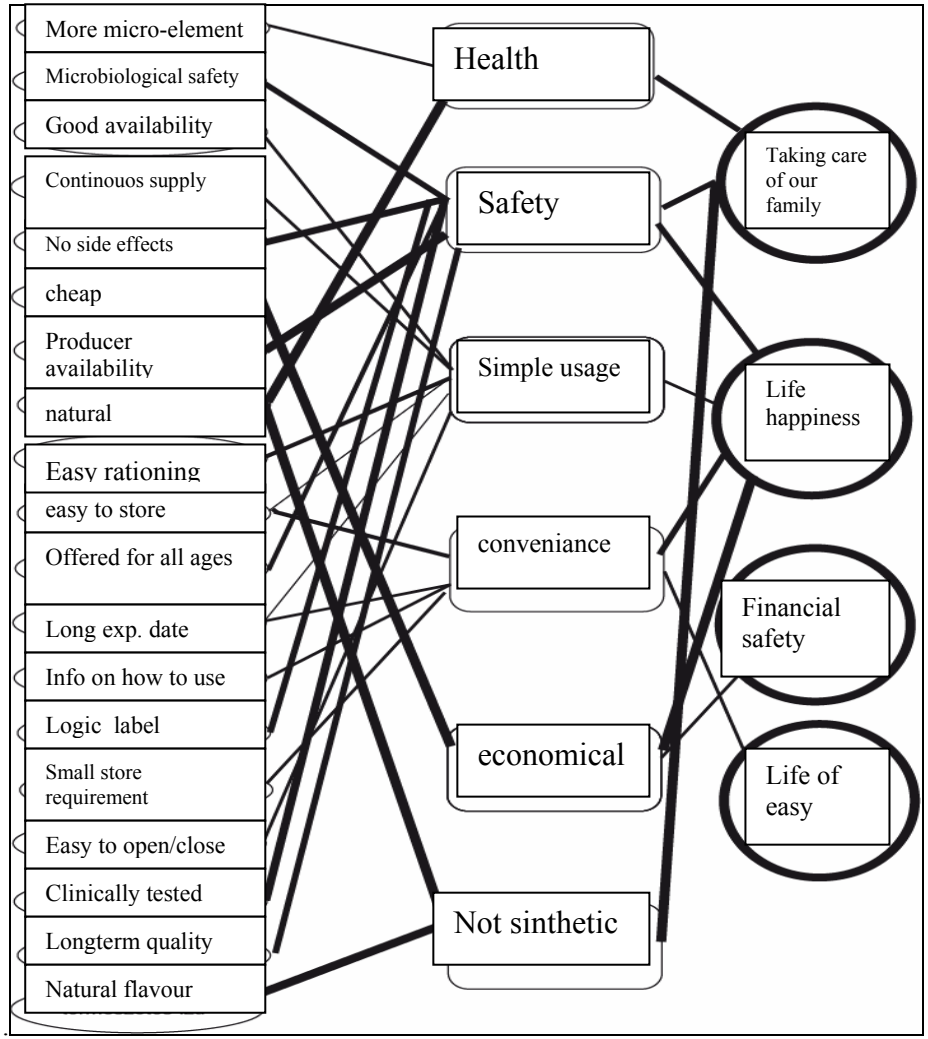

Figure 5.: The usage of means –and –chain analysis for the value mapping relating to iodine content product

5. NEW SCIENTIFIC RESULTS

1. After researche and analysis of the relevant literature and results of the representative complex investigations' in Hungary I pointed out, that the international studies and ratings underestimated the seriousness of the Hungarian iodine situation.
2. With the investigations of turkeys and milking-cows I have managed to prove, that the iodine enriched foddery has an extreme importance in the effective development of the animal husbandry, with special attention to the higher meat-yield and higher iodine content milk.
3. With investigations of goats I proved, that the effectiveness of iodine content foddery-supplements can be strongly influenced by the weather and environmental conditions that may cause changes in the milk-composition.
4. With direct questionnaire surveies I have showed, that even the highly qualified and well-posted stratum of the society have quite smattering knowledge relating to the importance and physiological key-roles of the healthy-nutrition.
5. With the help of qualitative and quantitative methods of conjoint analysis I indicated how iodine-supply could be optimalised.
6. I work-out a proposal for succesful realisation of the national iodine-prevention including aspects of the communication-strategy, budgetplanning, government subsidy and marketing-campaign for healthy nutrition respectively.
7. I have worked out an economical alternative of the iodine-prevention program, with using unique, high iodine content, Hungarian and

investigated mineral water examined and tested by competent medical experts.

6. CONSEQUENCES AND RECOMMENDATIONS

In my dissertation I have tried to show the fact in a complex way, that had already been investigated and justified by many scientific institutes and experts. According to this, majority of the Hungarian population is suffering from iodine deficiency and from the outgrowths thereof. Approximately 8 person out of ten are in direct connection with iodine deficiency symptoms. Representative, complex investigations made by the National Institute of Publichealth has proved, that the Hungarian iodine-deficiency is in by far the worse situation as it is estimated by some international organisations.

At the same time – according to our recent knowledge – it is probable, that the daily iodine requirement can simply covered by using only well-balanced, „natural origin" foodstuffs. With attention to the geo-physical and geo-chemical circumstances of Hungary – it is highly recommended to supplement the iodine deficiency with iodine intake, preferably with the usage of natural, iodine rich foodstuffs.

In my dissertation I have worked out a proposal way, that one of the possible alternative for the natural iodine-supplementation – both in case of humans and animals - is the consumption of iodine-rich foodstuffs (milk, milk-products, bakery-products, iodine content mineral water) and iodine rich foddery for the animals with using iodine content mineral water.

In to realize the effective Hungarian iodine-prevention program – according to the relevant literature and my own experiments' result – I would like to put forward refer the following proposals for the execution of the National Publichealth Strategy, up to 2010:

1. To inform as big part of the society as it possible about the importance of iodine-supplement, with special attention to the young parents and children.
2. To expand the regular medical surveillance and monitoring (students, pregnant and breast-feeding mothers), which help succesful diagnosis and elimination of the iodine deficiency disorders.
3. To make the most preferred iodine supplement available for pregnant and breast-feeding mothers for 1 year time without charge.
4. The full price-support of Health Insurance Company for one of the iodine content product, which is the most effective and most economical for the consumers.
5. To use and support the higher iodine content foddery in the animal nutrition. To develop and market new, effective, natural iodine content foddery-supplements.
6. To increase the iodine content of basic food stuffs (bread, milk, oil, butter, meat) as it has been made in many European countries.
7. The distribution of iodized salt shall be increased and regulated by law with special attention to the directives relating to the healthy nutrition.
8. Elimination of the Hungarian iodine deficiency shall form the organic part of the health governmental policy and the efforts to correct the iodine deficiency disorders affecting about 8 million people shall be subsidized by state.

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