UNIVERSITY OF GHENT

Faculty of Agricultural and Applied Biological Sciences

Department of Agricultural Economics

Division: Agro-Marketing

How do animal health products contribute to economic and environmentally-friendly livestock farming

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November 1994

CONTENT

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1. INTRODUCTION

Agriculture and animal husbandry changed considerably in the European Union (EU) within the span of a few decades. European agriculture, which consisted mainly of small family holdings after World War II, gradually evolved into large economically performing farms, as a result of scientific and technical progress.

Under the Common Agricultural Policy (CAP) farmers adapted to changes and learned to behave like business-managers, with maximizing profits and minimizing costs. Modern EU farmers had to take into account far more factors than their predecessors, namely farm policy, economic and technical

developments, market requirements and the environment. Animal health products and modern agricultural production techniques helped them to keep animals healthy and to produce safe, healthy and high quality food at economical prices for the consumer.

Against this background, the satisfied **consumers** gradually became more selective and vigilant in the 1980's. The era of consumerism slowly gave way to new consumption trends and behaviours. Self-awareness, body fitness, health awareness and animal welfare moods became increasingly fashionable. Nowadays, consumers regard veterinary pharmaceuticals and modern agricultural production techniques with mistrust. They stress the importance of an environment-friendly agriculture, request safe food free: from chemicals and want an unaittainable 'zero-residue level' in food.

The importance of veterinary medicinal products for modern agriculture cannot be underestimated. The animal health industry researches and develops products which are intended to control, prevent and cure diseases and which help the farmer in managing his herd.

The purpose of this research is to analyse the opinion of EU veterinarians with regard to the possible impact of veterinary medicinal products on the environment as well as to analyse the actual impact of veterinary medicinal products on performance and so, indirectly, on environmental burden and benefit.

2. METHODOLOGY

With the aim to analyse the effects of veterinary medicines on the environment, a survey is carried out.

The target group of the survey are **veterinarians,** practicing in the EU. They have a direct contact with animal production and have experience with the use and effects of veterinary medicines.

Among the EU-member states, the survey comprises the following countries:

Belgium and Luxemburg, France, Germany, Ireland, Italy, the Netherlands, United Kingdom, Spain.
Addresses of 22.686 veterinarians in these member states - are obtained by national organisations and institutions. Assumption is made that this number reflects the total population of practicing veterinarians.

Animal husbandry in the EU and thereto also veterinary medicines are concentrated on **pigs, cattle, sheep and poultry.** Therefore, the research was focused on these sectors of animal husbandry.

Taking into account the aim of the -survey, a **questionnaire** is set up, comprising the following parts (annex 1):

- introduction: interest of veterinarians in the environment,
- characteristics of the veterinarians: importance of various groups of animals in their practice, country of activity, kind of practice and age of the veterinarian,
- effect of various veterinary products, namely preventive and therapeutic antibiotics, preventive and therapeutic anthelmintics, ectoparasitic drugs and vaccines.

To collect the data, a **mail survey** is choosen, based on the extend of the target region.

A disproportional stratified sampling method is used, with the aim to take into account possible differences between the considered animal groups and countries. It implies that the **sample** is

constructed in two steps. In a first step, the sample is divided among various groups of animals. In a second step, a division among member states is considered.

Within the different strata or countries, the sample is taken ad random.

A sample size of 500 veterinarians or 2.2% of the population is foreseen. Based on an estimated response rate of 25%, a total of 2.000 questionnaires are distributed.

The 22.686 addresses of veterinarians are considered as the population. With a total random sample, a sample size of 380 respondents is necessary to obtain 95% certainty. This means, there is 95% certainty that a yes-answer of 50% of the veterinarians of the sample corresponds with a yes-answer of 45 to 55% of the veterinarians of the population. With a stratified sampling method, even a smaller sample size results in the same validity.

The division of the sample among the various groups of animals is based on the importance in the total EU-herds or production. As the figures are less comparable, the division is rather arbitrary and takes also into account the use of veterinary medicines for the various groups.

Table 1: Importance of the different animal herds in the EU-countries involved, 1993.

Group	Number	Unit	%	N
Cattle	77.051	1.000 animals	30	600
Pigs	96.406	1.000 animals	30	600
Laying hens	65.990	1.000.000 eggs	15	300
Broilers	4.401	1.000 tonnes meat	15	300
Sheep	85.297	1.000 animals	10	200
Total			100	2.000

Source: EUROSTAT.

The division of the sample among member states is based on the share of each country in the total population of the concerned animal group (annex 2).

(1) Information and discussion about response rates for mail surveys:
Crask, M.; Fox, R.J. & Stout, R.G.
Marketing research. Principles & applications.
Prentice Hall, Englewood Cliffs, New Jersey, 1994, p. 160 & 172.

In that way, the premised sample is given in table 2.

Table 2: Premised sample.

Country	Cattle	Pigs	Laying hens	Broilers	Sheep	Premised sample	
						n	%
B	24	48	13	12	2	99	5
Nl	37	86	43	27	4	197	10
UK	91	48	39	66	68	312	16
Ir	55	12	4	6	14	91	5
D	127	168	54	24	6	379	19
F	169	77	62	72	24	404	20

E	36	114	41	51	57	299	14
I	61	47	44	42	25	219	11
Total	600	600	300	300	200	2.000	100

Each veterinarian of the sample has received:
- the introductionary letter (annex 1),
- the questionnaire,
- a pre-stamped envelope.

During the period May - July 1994, the questionnaires were sent. The answers returned during the period 16 June - 2 September 1994 and are the sample.

The table below gives the comparison between questionnaires sent and returned.

Table 3: Response rate of the mail survey.

Country	Available addresses	Premised sample	Returned questionnaires			
			Answered			Unopened and blanco
			N	% (1)	% (2)	
B	1.722	99	40	40	10	2
NL	1.481	197	58	29	14	9
UK	820	312	64	21	15	10
IR	753	91	13	14	3	1
D	341	341	64	19	15	9
F	703	404	103	25	24	2
E	6.666	299	46	15	11	16
I	10.200	219	33	15	8	2
Total	22.686	1.962	421	21	100	51

(1) percentage of the premised sample, per country
(2) percentage of the valid sample (total = 421)

- Due to the limited number of German addresses, 341 questionnaires were sent instead of 379.
- From the returned questionnaires, 35 were unopened, due to incorrect addresses and 16 respondents returned a blanco questionnaire.
- Finally, the analysis comprises **421 respondents,** being 21% of the questionnaires sent, 84% of the expected sample and 1.9% of the population.

The response rate is relative higher than the average in Belgium, the Netherlands and France. An average response rate is obtained in United Kingdom and Germany, while a lower response rate is noticed in Spain, Ireland and Italy.

For the valid questionnaires, a LOTUS data-file is constructed. The analysis of the data is carried out by SPSS. Thereto, frequency and cross-tables are calculated.

For the cross-tabulation,-the significance (o) is given. A significance lower than 0.05 indicates that there is at least 95% certainty that the two tested variables are related.

In the next part, the results of the analysis are given, while the main conclusions follow in the last part.

3. RESULTS

3.1. SAMPLE

The respondents are divided into three **age** classes:

- < 40 years 200 respondents (48%)
- 40 - 50 years 125 respondents (30%)
- > 50 years 92 respondents (22%)

The relation with the country is given in annex 3.

Two respondents have not specified their **job**. The job or practice of the others is:

- a one-man business 151 respondents (36%)
- a group practice 221 respondents (53%)
- an integration 16 respondents (4%)
- a pharmaceutical industry 1 respondent (/)
- a food industry 10 respondents (2%)
- researcher 2 respondents (/)
- other 18 respondents (4%)

The other jobs refer especially to governmental institutions, related to animal husbandry and animal health. Further, a job at the university and farming are mentioned.

The relation with the country is given in annex 4.

The degree of **specialisation** of the veterinarians is obtained by asking the share of various groups of animals in their total time and the number of animals in their practice.

From the 421 respondents, eight specified none of the two elements, while seven only mentioned the number of animals.

The importance of the different groups of animals in the practice of the 406 other respondents is given in the table below. Distinction is made between specialists, who spend more than half of their time to one group of animals and generalists, who spend less than half of their time to each group of animals. The sample has about 90% specialists and 10% generalists.

Table 4: Importance of various groups of animals during working time, % respondents (n=406).

Group of animals	% of the working time		
	generalists		specialist
	0	1-49	≥ 50
pigs	47	44	9

cattle	29	31	39
poultry	78	22	1
sheep	46	53	1
pets	18	46	35
others	62	33	5

- Nearly 9% of the veterinarians is specialised in pigs.

- Cattle is the speciality of 39% of the veterinarians, where 23% is focussing on dairy cattle, 2% on beef cattle and 14% on both animal groups.

- Only three respondents are specialised in poultry, namely two in laying hens and one in broilers.

- Nearly 35% of respondents is specialised in pet animals, while 5% of respondents is concerned with other animals, especially horses. Beside horses, the 'other' groups are birds, wild animals, ducks and turkeys, rabbits, fish and a combination of different animals.

The relation between country and specialisation is given in annex 5.

- No Belgian, British, Irish or French veterinarian is spending more than 50% of his time on pigs.

- The specialisation in cattle is most pronounced in Ireland (84%) and Belgium (61%), followed by France (48%).

- Specialists in poultry are rare or non-existing in the countries considered.

- Sheep is an Irish specialisation, i.e. 84% of the veterinarians spent more than 50% of their working time on sheep.

The specification of the number of animals in the practice of the veterinarians is given in annex 6. A wide variation is noticed.

3.2. ATTITUDE TOWARDS THE ENVIRONMENT

With the aim to know the attitude towards the environment, the respondents were asked 9 **questions**, which could be answered by yes or no. The figure below gives a general overview, while the statistical results are presented in table 5.

Figure 1: Questions related to the environment, % yes-answers (n=420).

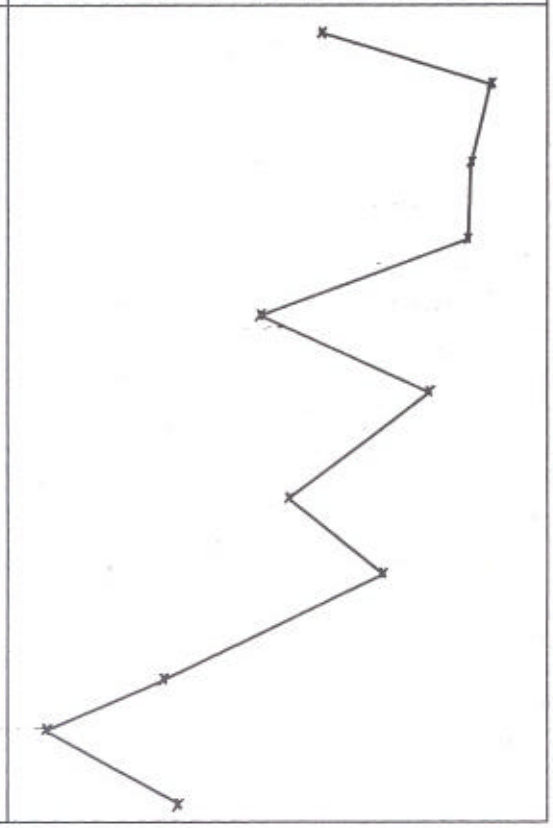
Question	0 10 20 30 40 50 60 70 80 90 100
Ever experienced any environmental problem	
Concerned about environmental pollution	
Ever read anything about environmental pollution	
Would devote yourself to the preservation and the protection of the environment	
Ever participated (financially or actively) in projects for the protection of the environment	
Ever heard that veterinary medicines may cause environmental problems	
Know that in the future manufacturers must be able to prove that their veterinary medicines are save for the environment	
Think that veterinary medicines contribute to environmental pollution	
Think that the therapeutic use of veterinary medicines - pollutes the environment	
- is good for the environment	
- is both polluting and good for the environment	

Table 5: Questions related to the environment, % yes-answers.

Table 5: Questions related to the environment, % yes-answers.

Question	total	country								age (years)			
		B	NL	UK	IR	D	F	E	I	a	< 40	40-50	> 50	a
Ever experienced any environmental problem	63	52	53	39	87	77	64	73	84	+	61	65	67	-
Concerned about environmental pollution	89	95	98	100	100	97	89	100	100	-	100	97	99	-
Ever read anything about environmental pollution	93	90	98	57	100	98	81	100	100	-	92	94	96	-
Would devote yourself to the preservation and the protection of the environment	93	83	98	71	100	100	94	98	87	+	93	93	81	-
Ever participated financially or actively in projects for the protection of the environment	62	36	74	52	48	78	27	62	86	-	46	62	63	-
Ever heard that veterinary medicines may cause environmental problems	86	78	96	84	82	88	78	91	91	-	84	90	89	-
Knows that in the future manufacturers must be able to prove that their veterinary medicines are safe for the environment	88	54	72	54	67	64	56	71	34	-	60	65	67	-
Think that veterinary medicines contribute to environmental pollution	77	64	82	63	77	74	78	98	88	+	78	78	71	-
Think that the therapeutic use of veterinary medicines - pollutes the environment - is good for the environment - is both polluting and good for the environment	30 8 33	28 8 28	40 3 19	14 9 28	23 8 39	28 8 3	23 7 58	63 4 4	49 5 36	-	35 5 30	28 6 35	23 9 38	-
n = 100%	420	40	68	63	13	64	103	46	33		199	125	92	

sf: significancy: * significant difference
- no significant difference

- Nearly 63% of the respondents has already experienced any environmental problem. This is significant more the case in Italy (94%) and Germany (77%) and less in United Kingdom (39%).

- Nearly all veterinarians indicate to be concerned about environmental pollution.

- In total, 93% of respondents has ever read anything about environmental pollution. The number is significant far below average in France (81%).

- Again, 93% of respondents would devote themself to the preservation and the protection of the environment. United Kingdom makes an exception, as only 71% of the veterinarians would devote themself.

- Nearly 52% of the respondents has already financially or actively participated in projects for the protection of the environment.

  The participation is significant higher in Germany (78%) and the Netherlands (74%) and lower in France (27%) and Belgium (36%).

  The age group 40-50 years has significantly more participated (62%), than younger veterinarians (46%), while the older group takes a middle position (53%).

- About 86% of the respondents has already heard that veterinary medicines may cause environmental problems. A lower part than average is noticed in Belgium and France (74%). A higher part than average is observed in the Netherlands (95%), Ireland (92%), Spain (91%) and Italy (91%).

- Nearly 58% of the veterinarians knows that in the future manufacturers must be able to prove that their veterinary medicines are save for the environment. Especially Dutch (72%), Spanish (71%) and Irish (67%) veterinarians indicate to be aware of this fact, against only 34% of the Italian veterinarians. The awareness of this fact increases significantly with the age of the respondents.

- About 77% of respondents think that veterinary medicines contribute to environmental pollution. This belief is mostly pronounced in Spain (96%) and Italy (88%) and less in Belgium (64%) and United Kingdom (63%).

- Nearly one third of the respondents gives no opinion about the impact of the therapeutic use of veterinary medicines on the environment. About 33% of the respondents thinks that the therapeutic use of veterinary medicines is both polluting and good for the environment. About 30% thinks that it pollutes the environment, while only 6% thinks it is good for the environment.

  The belief that the therapeutic use pollutes the environment is especially pronounced in Spain, Germany, the Netherlands and Italy. A relative large part of respondents in United Kingdom, Ireland and France agrees with the double impact of the therapeutic use.

Seven **statements** were presented to the respondents. They could indicate to what extend they agree, by using the following options:

1 do not agree at all
2 do not agree
3 agree
4 fully agree.

In the figure below, the total results are presented, while the details follow in annex 7.

- Related to the goals of the veterinary surgeon, respondents nearly fully agree that this goal is to take care of the well-being of livestock.

  An agreement is noticed for the statement that the goal is the promotion of the productivity of livestock.

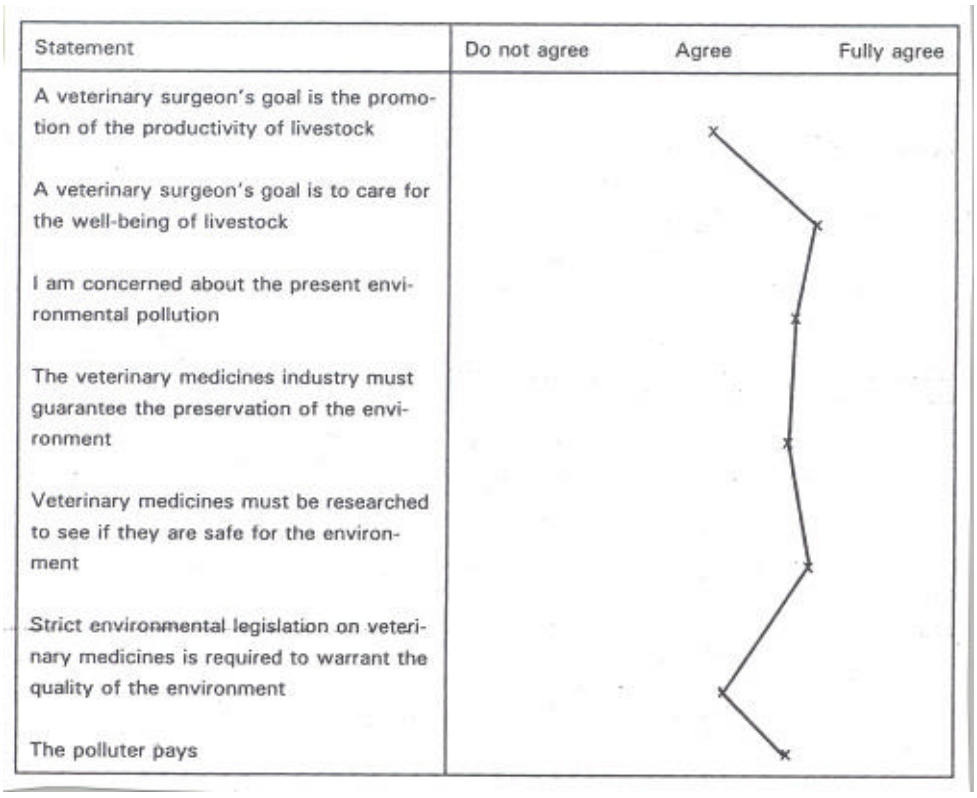
- The respondents nearly fully agree with the statement that they are concerned about the present environmental pollution.

- The respondents nearly fully agree that the veterinary medicines industry must guarantee the preservation of the environment and that veterinary medicines must be researched to see if they are safe for the environment.

- An agreement is noticed for the statement that strict environmental legislation on veterinary medicines is required to warrant the quality of the environment.

- The respondents nearly fully agree with the principle 'the polluter pays'.

Figure 2: Degree of agreement with the statements.



Related to the attitude of veterinarians in general, the results make clear that they are concerned about environmental problems. Despite the fact that they have a low experience with environmental problems and the participation in protection projects, they have read about environmental problems. They are

willing to devote themself to the preservation and protection of the environment, but their main goals remain to take care of the well-being of animals and the promotion of the productivity of livestock.

For veterinary medicines, a strict legislation and extended research are required to guarantee the quality of the environment. The veterinary medicines industry has hereby an important role. Further, the veterinarians agree upon the principle 'the polluter pays'.

The impact of veterinary medicines on the environment is good on the one hand, but can be polluting on the other hand. In that respect, veterinarians have already heard about cases, where veterinary medicines cause environmental problems.

3.3. IMPACT OF VETERINARY MEDICINES

This section analyses the indirect impact of veterinary medicines on the environment, based upon the veterinarians' opinions. Thereto, a list of elements related to the impact should be completed for the most important group of animals in their practice, based on a situation with and an imaginary situation without veterinary medicines. For the veterinary medicines, a distinction is made between antibiotics, anthelmintics, anti ectoparasitic drugs and vaccines.

An important remark is made by the respondents. None of them had precise figures about the impact of veterinary medicines on the animals in their practice. It means that the given impact is based on the daily experience of the veterinarians. Veterinarians suggest elaborated epidemiological research to obtain more exact data.

Figures about the evaluations by country and by group of animals is given in annex 8.

Table 6 indicates the impact of veterinary medicines for different groups of animals. More detailled figures for the different groups follow in annex 9.

Impact	pigs	cattle	poultry	sheep	horse
Situation with veterinary medicines					
Sick animals treated with					
antibiotics	72	68	60	35	42
anthelmintics	37	19	8	86	36
anti ectoparasitic drugs	30	14	2	55	8
Treated sick animals destroyed prematurely					
antibiotics	8	6	1	18	2
anthelmintics	2	1	0	4	2
anti ectoparasitic drugs	1	1	0	4	0
vaccines	3	1	0	6	0
Economic loss due to inefficiency of vaccin					
% of farmer's income	16	13	-	7	10
Situation without veterinary medicines					
Animals sick and destroyed prematurely due to no treatment					
preventive antibiotics	18	15	18	17	7
therapeutic antibiotics	36	43	35	34	19
anthelmintics	10	22	20	18	24
anti ectoparasitic drugs	9	8	6	7	6
vaccines	36	25	53	30	12
Total economic loss (in % of farmer's income) due to no treatment					
growth promotors	14	9	10	28	8
anthelmintics	15	22	58	35	44
anti ectoparasitic drugs	11	11	8	14	11
vaccines	31	23	75	35	16
Same production as with veterinary medicines					
% of current livestock	154	189	125	128	173

In the **situation with veterinary medicines**, 60% to 72% of sick pigs, cattle and poultry are treated with antibiotics. The use of anthelmintics and anti ectoparasitic drugs is much lower and refers to nearly one third of the sick pigs, around 16% of the sick cattle and around 5% of the sick poultry.

For sheep, the use of veterinary medicines is quite different. Here, well over 86% of sick animals are treated with anthelmintics and 55% with anti ectoparasitic drugs, while only one third receives antibiotics.

Sick horses are mostly treated with antibiotics and anthelmintics. The use of anti ectoparasitic drugs for horses remains limited.

Despite the treatment, a part of the sick animals has to be destroyed prematurely. For anthelmintics, anti ectoparasitic drugs and vaccines, these parts remain less than 5% of the treated animals. A higher percentage is noticed for the use of antibiotics and that especially for sheep.

A premature destruction is possible, but the slaughter for human consumption requires a certain time period between the application of veterinary medicines and slaughter.

In a normal situation, vaccination leads to an immune livestock and by that way, reduces the outbreaks of diseases. However, the vaccination is not always succesfull, which results in an economic loss for the farmer. This economic loss represents 7% of farmer's income for sheep and around 15% for pigs and cattle. No results are obtained for poultry.

In the **situation without veterinary medicines**, a larger part of the livestock will get sick and will be destroyed prematurely. This share of sick and prematurely destroyed animals represents one fourth to more than half of the livestock for therapeutic antibiotics and vaccines. This share remains around 15% to 22% for preventive antibiotics and anthelmintics. Exception is made for cattle, where not using anthelmintics results only in 10% sick and prematurely destroyed animals. For anti ectoparasitic drugs, the share of sick and prematurely destroyed animals remains below 10%.

In this situation of no treatment, a premature destruction is the most drastic loss. Beside that, there can be other costs. The total economic loss, due to among others growth delay and stress, is the highest when no vaccines are used, namely from 23% of farmer's income for cattle to 75% for poultry.

For pigs, the total economic loss of not using growth promotors, anthelmintics or anti ectoparasitic drugs remains between 11% and 15% of farmer's income.

For cattle, the economic loss represents 22% of farmer's income for anthelmintics and around 10% for growth promotors and anti ectoparasitic drugs.

Also for poultry, not using anthelmintics will lead to large economic losses.

For sheep, the impact of anthelmintics is the same as for vaccines. Here, also for growth promotors, a large impact is noticed.

A high economic loss is noticed as a result of no anthelmintic treatment of horses.

Finally, the veterinarians have the opinion that in a situation without veterinary medicines, livestock must increase with 25% (poultry) to 89% (cattle) to obtain the same production level as today.

3.4. REMARKS

The respondents were given the possibility to express their remarks related to the topic.

Concerning the **use** and the **impact** of **veterinary medicines**, the following remarks are noticed.

- The preventive use of veterinary medicines resulted in the development of animal husbandry in general and intensive animal husbandry in particular.

- The treatment of animals with preventive and curative drugs is not only necessary for animal production, but also for ethical reasons (animal welfare).

- Without veterinary medicines, no animal production is possible.

- Preventive medicines and improved prophylaxy are of all solutions, the most adequate, best, most animal and environmental friendly treatments.

- The impact of veterinary medicines varies depending on the age of the animal, the kind of disease, the farming circumstances and the used doses.

- Veterinary medicines are used mostly curative. A lot of factors should be preventively managed by the farmer in order to limit the outbreaks of diseases.

- Not only veterinary medicines have an impact on animal production. The results are also influenced by other factors, such as hygiene and feed.

The relation between **veterinary medicines and environmental pollution** resulted in the following remarks.

- Antibiotics are mostly natural products, which will be broken down in their components at disposal in nature. By that, there is no environmental problem.

  Anthelmintics and anti ectoparasitic drugs are synthetic products and will have a larger impact on the environment.

- Beside the use of veterinary medicines, there is an important waste disposal by veterinarians, namely out-dated medicines, veterinarians' materials and the packaging of medicines and materials.

- The influence of veterinary medicines on the environment depends on the quality of management at farm level. With a good management, the use of veterinary medicines and the impact on the environment is low.

- Veterinarians are lacking information about waste, recycling, ...

- Some drugs inevitably pollute, however the problem of non use may be serious adverse welfare. Drugs should be screened on an ongoing review basis and withdrawn when safer, similarly cost effective and equally effective alternatives become available.

Related to the **legislation** is stated:

- A more extended request for research by a more strict legislation increases the cost of the veterinary medicines industry. However, research costs should be well balanced. In that way, there remains enough products available so that veterinarians can effectively help animal production.

- Current and proposed legislation regarding medicines will week the veterinary profession and the agricultural industry. The EU policy simply will not be able to pay for the nonsense it is legislating.

- Beside a strict legislation, common sense and intelligent cooperation between the interest groups are necessary.

- Veterinary medicines are used in two ways. A first is the use, prescribed and coordinated by veterinarians. A second is the use of veterinary medicines by the farmer himself or by means of medicated feed, supplied by the feed industry. In the perspective of the quality of food products, also this last use of veterinary medicines should be good regulated and coordinated.

- The same legislation should exist for all countries.

For the **situation without veterinary medicines**, the respondents make the following remarks.

- A decrease of the use of veterinary medicines requests a larger livestock population to obtain the same production level. This results in a higher density and larger economic losses in production. The increased number of livestock will result in more severe environmental problems.

- Everything is possible in animal husbandry, it only depends on the price that the consumer is willing to pay for his food.

- In a situation without veterinary medicines, animals will suffer more. So, this decreases animal welfare.

- 80% of drugs are a necessary evil.

- The EU has now surplusses of animal products, resulting in low prices. Reducing the production to a situation of self sufficiency is suggested to improve the economic situation of farmers, without negative impact for consumers.

4. CONCLUSION

Veterinarians are aware of possible environmental problems and know that veterinary medicines may contribute to environmental pollution. However, the actual outcome of the survey is that veterinary medicines contribute to the protection of the environment because in the absence of drugs the increase in livestock would be 25% to 89% to obtain the same production level. Considering the additional production factors, as well as the additional output of manure, it is obvious that veterinary medicines contribute significantly to the protection of the environment and to animal welfare.

Annex 1: Introductionary letter and questionnaire.

UNIVERSITEIT GENT

FACULTEIT VAN DE LANDBOUWKUNDIGE EN TOEGEPASTE BIOLOGISCHE WETENSCHAPPEN

VAKGROEP LANDBOUWECONOMIE

Coupure Links 653
B-9000 Gent

Tel. [091] 64 59 77
Fax [091] 64 62 46

April 1994

Dear Madam,
Dear Sir,

Research is being carried out at Ghent University in Belgium, into the effects of veterinary medicines on the environment. In that connection your cooperation is of the greatest importance for us.

From a list of all vets in the European Union, 2,000 vets were selected who are in daily contact with animal production. The vets ensure the health and well-being of the farm animals and know from experience what the consequences of a disease may be for the animal, its environment, its productivity and the yield.

Since you belong to this group of experts, we have taken the liberty to ask you for your cooperation in our research.

Filling out the questionnaire will take about 15 minutes.

We hope that you will be prepared to do this and to return the completed questionnaire as soon as possible in the envelope provided.

Of course this research will be conducted in such a way that complete anonymity is guaranteed.

Should you have any questions, you can always reach us at the following telephone number:

+32-9-264.59.45.

We should like to thank you in anticipation for your willingness to cooperate.

Prof. Dr. Jacques Viaene M. Sc.

Ann De Craene M. Sc.

UNIVERSITEIT GENT

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VAKGROEP LANDBOUWECONOMIE

Coupure Links 653
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Tel. (091) 44 58 27
Fax. (091) 44 62 46

The effects of veterinary medicines on the environment

1. Some introductory questions. Please tick the appropriate answer.

1. Have you ever experienced any environmental problems? ☐ YES ☐ NO

2. Are you concerned about environmental pollution? ☐ YES ☐ NO

3. Have you ever read anything about environmental pollution? ☐ YES ☐ NO

4. Would you devote yourself to the preservation and the protection of the environment? ☐ YES ☐ NO

5. Have you ever participated (financially or actively) in projects for the protection of the environment? ☐ YES ☐ NO

6. Have you ever heard that veterinary medicines may cause environmental problems? ☐ YES ☐ NO

7. Do you know that in the future manufacturers must be able to prove that their veterinary medicines are safe for the environment? ☐ YES ☐ NO

8. Do you think that veterinary medicines contribute to environmental pollution? ☐ YES ☐ NO

9. Do you think that the therapeutic use of veterinary medicines

   - pollutes the environment ☐ YES ☐ NO
   - is good for the environment ☐ YES ☐ NO
   - is both polluting and good for the environment ☐ YES ☐ NO

2. **Please tick to what extent you agree with the following statements. You have the following options:**

1: do not agree at all
2: do not agree
3: agree
4: fully agree
5 : don't know

• I am concerned about the present environmental pollution.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• A veterinary surgeon's goal is the promotion of the productivity of livestock.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• The veterinary medicines industry must guarantee the preservation of the environment.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• Veterinary medicines must be researched to see if they are safe for the environment.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• The polluter pays.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• Strict environmental legislation on veterinary medicines is required to warrant the quality of the environment.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
• A veterinary surgeon's goal is to care for the well-being of livestock.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3. Please indicate how important various groups of animals are in your practice. State which proportion each group of animals takes up from your total time and how many animals there are in your practice.

	%-share of your total time	number of animals
pigs:		
pork pigs	.....	.....
sows	.....	.....
piglets	.....	.....
cattle:		
dairy cows	.....	.....
beef cattle	.....	.....
calves	.....	.....
poultry:		
laying-hens	.....	.....
broilers	.....	.....
sheep	.....	.....
pet animals	.....	
other (please specify) :		
.....	.....	.....

4. **We want to find out the effect of various veterinary medicines.**
Please answer this question for the main group of animals in your practice.

In your case the following group of animals is concerned:.....

1. How many of the sick animals in your practice are treated with:

   - antibiotics ...% sick animals
   - anthelmintics ...% sick animals
   - ectoparasitic drugs ...% sick animals

2. How many of the sick animals in your practice which were treated, must be destroyed prematurely:

   - antibiotics ...% treated animals
   - anthelmintics ...% treated animals
   - ectoparasitic drugs ...% treated animals
   - vaccines ...% treated animals

3. Suppose that there are no veterinary medicines. How many animals would get sick and must be destroyed prematurely, because you could not treat them:

   - preventive antibiotics ...% animals
   - therapeutic antibiotics ...% animals
   - preventive anthelmintics ...% animals
   - therapeutic anthelmintics ...% animals
   - anti-ectoparasitic drugs ...% animals
   - vaccines ...% animals

4. Suppose again that there are no veterinary medicines. What would be the total economic loss (growth delay, stress,...) in livestock, because the animals cannot be treated:

   - growth promotors ...% } of the
   - anthelmintics ...% } farmer's
   - ectoparasitic drugs ...% } total
   - vaccines ...% } income

5. What is the economic loss caused by the vaccination itself due to the inefficiency of the vaccin:
   ...% of the farmer's income

5. **Let us assume that the livestock which today leads to a certain production with the use of veterinary medicines is 100%.**

   Determine how many animals it would take to achieve the same production, if there were no veterinary medicines:

   ...% of the current livestock

6. **We should also like to have some personal information which will allow us to process the questionnaire.**

1. Name: .....

2. Country and region of activity:

3. Age
   - ☐ 30 years old
   - ☐ 30-40 years old
   - ☐ 40-50 years old
   - ☐ 50-60 years old
   - ☐ 60-70 years old
   - ☐ 70 years old

4. Your practice/work is as follows
   - ☐ I have a one-man business
   - ☐ I work in a group practice
   - ☐ I work in an integration
   - ☐ I work in the pharmaceutical industry
   - ☐ I work in a food industry
   - ☐ My main job is research
   - ☐ Other (please specify) : .....

7. **Have you got any remarks and/or comments?**

.....

.....

.....

.....

.....

Annex 2: Share of the concerned member states in EU-animal population.

Table 1: Cattle.

Animals 1993	Cattle: total		Calves < 1 year		Dairy cows ≥ 2 year		Other cattle	
unit	1.000 pieces	%	1.000 pieces	%	1.000 pieces	%	1.000 pieces	%
B	3.257	4	999	4	690	3	1.568	5
NL	4.797	6	1.689	7	1.804	9	1.304	4
UK	11.795	15	3.239	14	2.677	13	5.879	17
IR	7.023	9	1.739	8	1.281	6	4.003	12
D	16.151	21	5.308	23	5.255	26	5.588	16
F	21.273	28	6.668	25	4.450	22	11.155	32
E	5.071	6	1.591	7	1.435	7	2.045	6
I	7.684	10	2.386	10	2.280	11	3.018	9
Total	77.051	100	22.619	29	19.872	26	34.560	45
EU-12	81.362		24.065		21.214		36.083	

Source: EUROSTAT.

Table 2: Pigs.

Animals 1993	Pigs: total		Piglets < 20 kg		Slaughtering pigs > 20 kg		Sows	
unit	1.000 pieces	%	1.000 pieces	%	1.000 pieces	%	1.000 pieces	%
B	7.413	8	2.121	8	4.483	8	788	8
NL	13.878	14	5.347	20	7.102	12	1.402	14
UK	7.910	8	2.169	8	4.771	8	922	9
IR	1.513	2	424	2	911	2	172	2
D	26.755	28	7.392	27	16.346	28	2.922	29
F	12.998	13	3.177	12	8.514	14	1.249	12
E	17.971	19	4.851	18	11.059	19	1.959	20
I	7.968	8	1.402	5	5.929	10	614	6
Total	96.406	100	26.883	29	59.115	61	10.028	10
EU-12	111.651		31.429		68.039		11.726	

Source: EUROSTAT.

Table 3: Poultry and sheep.

Animals	Laying hens (1993)		Broilers (1993)		Sheep (1993)	
unit	eggs 10^6 pieces[1]	%	meat 1.000 tonnes[2]	%	1.000 pieces	%
B	3.027	4	166	4	125	1
NI	9.324	14	389	9	1.830	2
UK	8.804	13	969	22	29.332	34
IR	456	1	74	2	5.990	7
D	11.774	18	359	8	2.359	3
F	13.684	21	1.046	24	10.401	12
E	9.109	14	766	17	24.591	29
I	9.812	15	631	14	10.669	12
Total	65.990	100	4.401	100	85.297	100
EU-12	69.892		4.865		96.771	

Source: EUROSTAT.

1 production of eggs

2 production of meat from poultry

Annex 3: Respondents by country and age, % ($\alpha = 0.00001$).

Country	age class (year)			n = 100%
	< 40	40 - 50	> 50	
B	50	33	17	40
NL	41	42	17	58
UK	35	32	33	63
IR	31	54	15	13
D	30	44	26	63
F	48	28	24	102
E	73	11	16	45
I	85	3	12	33
total	48	30	22	417

Annex 4: Respondents by country and job, %.

Jobs:

1 one-man practice
2 group practice
3 integration
4 pharmaceutical industry
5 food industry
6 researcher
7 other

Country	job							n = 100%
	1	2	3	4	5	6	7	
B	70	23	7					40
NL	21	76	2				2	58
UK	31	64	2				3	64
IR	46	54						13
D	25	55	6	2	3	1	8	64
F	32	65	2				1	103
E	42	20	9		13	2	13	45
I	53	28	3		6		9	32
total	36	53	4	/	2	/	4	419

Annex 5: Specialisation of veterinarians by country, % respondents.

Country	group of animals	% of the working time		
		0	1 - 49	≥ 50
Belgium n = 39	pigs	44	56	0
	cattle	23	15	61
	poultry	80	20	0
	sheep	33	67	0
	others	20	41	39
Netherlands n = 56	pigs	36	52	12
	cattle	32	41	27
	poultry	66	34	0
	sheep	30	70	0
	others	7	50	43
United Kingdom n = 64	pigs	56	44	0
	cattle	30	42	28
	poultry	83	16	1
	sheep	31	69	0
	others	8	33	59
Ireland n = 13	pigs	69	31	0
	cattle	8	8	84
	poultry	100	0	0
	sheep	23	69	8
	others	8	61	31
Germany n = 62	pigs	10	53	37
	cattle	19	40	41
	poultry	81	18	1
	sheep	66	34	0
	others	37	56	7
total n = 406	pigs *	47	44	9
	cattle *	29	31	39
	poultry -	77	22	1
	sheep *	46	53	1
	others *	15	44	41

Country	group of animals		% of the working time		
			0	1 - 49	≥ 50
France n = 102	pigs		58	42	0
	cattle		27	26	47
	poultry		71	28	1
	sheep		46	54	0
	others		1	48	51
Spain n = 39	pigs		56	28	15
	cattle		44	28	28
	poultry		87	13	0
	sheep		54	44	3
	others		26	41	33
Italy n = 31	pigs		64	29	7
	cattle		48	26	26
	poultry		81	19	0
	sheep		84	10	6
	others		23	23	54
total n = 406	pigs	*	47	44	9
	cattle	*	29	31	39
	poultry	-	77	22	1
	sheep	*	46	53	1
	others	*	15	44	41

others: including pets and 'other' animals

significant differences between countries:

* significant difference

\- no significant difference

Annex 6: Number of animals in the practice, % respondents (n = 287).

Number of animals	group of animals													
	pigs				cattle				poultry			sheep	pets	other
	1	2	3	total	4	5	6	total	7	8	total			
0/n.s.	53	56	76	45	29	47	172	26	88	89	83	51	49	72
1-100	5	7	1	7	3	2	5	2	1	1	1	6	7	7
101-500	6	10	1	8	8	15	6	5	1	1	2	14	9	10
501-1000	4	7	2	3	9	9	9	2	1	1	1	7	10	3
1001-5000	7	14	9	8	29	18	14	25	1	1	1	10	18	5
5001-10000	7	3	4	5	12	7	4	17	1	1	1	4	5	0
10001-25000	8	2	2	12	6	1	2	20	2	1	2	4	1	1
>25000	9	1	4	12	2	1	-	5	4	5	9	2	1	2

1 fattening pigs
2 sows
3 piglets

4 dairy cows
5 beef cattle
6 calves

7 laying hens
8 broilers

Annex 7: Degree of agreement with the statements.

Statement	(1)	total	B	NL	UK	IR	D	F	E	I
A veterinary surgeon's goal is the promotion of the productivity of livestock	n	403	39	53	63	13	63	98	44	30
	x	3.02	3.33	2.74	2.62	2.69	3.43	3.22	2.83	2.83
	s	0.84	0.62	0.96	0.81	0.95	0.61	0.77	0.88	0.83
A veterinary surgeon's goal is to care for the well-being of livestock	n	414	39	57	64	12	64	101	44	33
	x	3.61	3.64	3.61	3.81	3.92	3.73	3.51	3.18	3.67
	s	0.59	0.63	0.62	0.43	0.29	0.48	0.56	0.79	0.54
I am concerned about the present environmental pollution	n	412	38	57	62	13	63	100	46	33
	x	3.45	3.37	3.30	3.37	3.38	3.54	3.42	3.59	3.70
	s	0.63	0.67	0.65	0.68	0.51	0.67	0.57	0.62	0.47
The veterinary medicines industry must guarantee the preservation of the environment	n	414	39	58	63	13	62	101	46	32
	x	3.44	3.26	3.36	3.27	3.77	3.34	3.57	3.67	3.50
	s	0.66	0.75	0.67	0.63	0.44	0.72	0.61	0.63	0.51
Veterinary medicines must be researched to see if they are safe for the environment	n	416	39	58	64	13	63	100	46	33
	x	3.56	3.49	3.60	3.52	3.85	3.51	3.44	3.76	3.73
	s	0.58	0.64	0.59	0.56	0.38	0.56	0.59	0.57	0.45
Strict environmental legislation on veterinary medicines is required to warrant the quality of the environment	n	386	37	54	62	11	59	91	43	29
	x	3.12	3.00	3.04	2.94	3.64	3.14	3.10	3.42	3.17
	s	0.82	0.82	0.85	0.88	0.50	0.80	0.80	0.76	0.80
The polluter pays	n	399	38	57	61	13	63	92	44	31
	x	3.41	3.39	3.32	3.31	3.69	3.41	3.38	3.55	3.58
	s	0.72	0.86	0.71	0.79	0.48	0.64	0.68	0.76	0.67

(1) n: number of respondent; x: average value; s: standard deviation

Annex 8: Impact of veterinary medicines for different groups of animals: number of evaluations per country and group of animals.

Group of animals	country								total
	B	NL	UK	IR	D	F	E	I	
fattening pigs	0	0	0	0	2	0	2	0	4
sows	0	1	0	0	2	0	1	0	4
piglets	0	0	0	0	0	0	0	0	0
pigs	2	14	2	0	24	1	6	2	51
dairy cows	1	8	5	1	9	21	2	6	53
beef cattle	5	0	0	0	0	1	0	0	6
calves	0	0	0	0	1	1	0	0	2
cattle	20	11	9	4	22	27	9	1	103
laying hens	0	0	0	0	0	0	0	0	0
broilers	0	0	0	0	0	0	0	0	0
poultry	0	0	0	0	1	2	0	0	3
sheep	1	0	0	1	0	0	5	2	9
pets	9	15	16	1	0	25	8	13	87
horses	1	3	1	0	1	5	0	1	12
wild animals	0	0	0	0	0	0	2	0	2
ducks, turkeys	0	0	0	0	0	2	0	0	2
divers group	0	0	0	0	0	0	1	0	1
missing	1	7	31	6	3	18	11	7	85
total	40	58	64	13	64	103	46	33	421

Annex 9: Impact of veterinary medicines for different groups of animals.

Table 1: Different groups of animals.

Impact	pigs			cattle			poultry			sheep		
	n	x	s	n	x	s	n	x	s	n	x	s
Situation with veterinary medicines												
Sick animals treated with												
antibiotics	58	72	26	159	68	23	3	60	27	9	35	33
anthelmantics	53	37	39	148	19	22	3	8	3	9	66	29
anti ectoparasitic drugs	51	30	33	147	14	20	3	2	3	9	55	44
Treated sick animals destroyed prematurely												
antibiotics	51	8	13	152	6	12	2	1	1	7	18	25
anthelmintics	38	2	3	117	1	2	2	0	0	7	4	5
anti ectoparasitic drugs	35	1	1	112	1	1	2	0	0	7	4	6
vaccines	39	3	14	111	1	3	2	0	0	6	8	8
Economic loss due to inefficiency of vaccin												
% of farmer's income	48	18	17	110	13	14	0	-	-	7	7	7
Situation without veterinary medicines												
Animals sick and destroyed prematurely due to no treatment												
preventive antibiotics	49	18	21	139	15	19	2	18	25	8	17	23
therapeutic antibiotics	52	36	29	124	43	29	2	35	7	6	34	29
anthelmintics	47	10	16	122	22	23	2	20	14	8	18	13
anti ectoparasitic drugs	44	9	17	111	8	14	2	6	6	7	7	9
vaccines	48	36	30	122	25	23	2	53	53	8	30	25
Total economic loss due to no treatment												
growth promotors	43	14	20	85	9	12	2	10	14	7	28	27
anthelmintics	48	16	12	131	22	15	2	58	60	8	35	19
anti ectoparasitic drugs	47	11	9	122	11	11	2	6	4	7	14	10
vaccines	51	31	20	129	23	18	2	75	35	8	36	32
Same production as with veterinary medicines												
% of current livestock	40	154	51	122	189	216	1	125	0	4	126	10

Table 2: Pigs.

Impact	fattening pigs			sows			pigs		
	n	x	s	n	x	s	n	x	s
Situation with veterinary medicines									
Sick animals treated with									
antibiotics	4	65	34	4	65	17	50	74	26
anthelmintics	4	27	49	4	22	33	45	39	39
anti ectoparasitic drugs	3	53	45	4	12	13	44	30	33
Treated sick animals destroyed prematurely									
antibiotics	4	10	11	3	4	5	44	8	13
anthelmintics	2	1	1	1	0	0	35	2	3
anti ectoparasitic drugs	2	1	1	1	0	0	32	1	1
vaccines	2	1	1	2	1	1	35	4	15
Economic loss due to inefficiency of the vaccin									
% of farmer's income	2	23	11	3	30	27	41	14	17
Situation without veterinary medicines									
Animals sick and destroyed prematurely due to no treatment									
preventive antibiotics	4	38	34	2	1	1	43	17	19
therapeutic antibiotics	4	39	33	4	31	33	44	36	29
anthelmintics	4	14	24	2	10	7	41	10	15
anti ectoparasitic drugs	3	19	27	3	4	5	38	9	17
vaccines	4	25	19	4	36	34	40	37	31
Total economic loss due to no treatment									
growth promotors	4	7	4	3	5	0	36	15	21
anthelmintics	4	10	13	4	11	10	40	16	16
anti ectoparasitic drugs	3	13	15	4	7	6	40	11	8
vaccines	4	23	19	4	26	17	43	32	20
Same production as with veterinary medicines									
% of current livestock	4	140	14	1	200	0	35	157	49

Table 3: Cattle.

Impact	dairy cows			beef cattle			calves			cattle		
	n	x	s	n	x	s	n	x	s	n	x	s
Situation with veterinary medicines												
Sick animals treated with												
antibiotics	52	83	27	6	63	29	2	93	11	99	70	21
anthelmintics	47	14	19	6	38	23	2	3	4	93	21	22
anti ectoparasitic drugs	45	10	18	6	30	23	2	53	67	94	14	19
Treated sick animals destroyed prematurely												
antibiotics	49	8	13	6	1	2	2	3	4	95	6	12
anthelmintics	37	2	4	6	1	1	2	1	1	72	1	2
anti ectoparasitic drugs	36	1	2	5	1	1	2	0	0	69	1	1
vaccines	34	1	2	6	1	2	2	0	0	69	2	3
Economic loss due to inefficiency of vaccin												
% of farmer's income	34	12	12	6	21	18	1	5	0	69	13	15
Situation without veterinary medicines												
Animals sick and destroyed prematurely due to no treatment												
preventive antibiotics	38	10	16	6	29	30	2	35	21	67	15	20
therapeutic antibiotics	43	36	30	6	42	35	2	40	14	88	46	28
anthelmintics	38	17	19	6	25	24	2	5	7	78	26	24
anti ectoparasitic drugs	33	4	5	6	25	24	2	3	4	69	9	15
vaccines	37	20	23	6	28	21	2	10	14	77	27	23
Total economic loss due to no treatment												
growth promotors	24	8	11	5	16	20	2	15	7	54	9	12
anthelmintics	41	19	12	6	28	14	2	5	7	82	23	16
anti ectoparasitic drugs	37	10	8	6	23	18	2	3	4	77	11	12
vaccines	39	20	18	6	32	16	2	6	7	82	24	19
Same production as with veterinary medicines												
% of current livestock	38	160	68	6	197	66	2	120	0	76	186	120

Table 4: Horses.

Impact	horses		
	n	x	s
Situation with veterinary medicines			
Sick animals treated with			
antibiotics	12	42	20
anthelmintics	12	36	39
anti ectoparasitic drugs	11	8	5
Treated sick animals destroyed prematurely			
antibiotics	9	2	5
anthelmintics	9	2	5
anti ectoparasitic drugs	7	0	0
vaccines	6	0	0
Economic loss due to inefficiency of the vaccin			
% of farmer's income	8	10	11
Situation without veterinary medicines			
Animals sick and destroyed prematurely due to no treatment			
preventive antibiotics	9	7	11
therapeutic antibiotics	11	19	13
anthelmintics	11	24	24
anti ectoparasitic drugs	8	6	10
vaccines	9	12	11
Total economic loss due to no treatment			
growth promotors	4	8	15
anthelmintics	7	44	34
anti ectoparasitic drugs	7	11	9
vaccines	7	16	16
Same production as with veterinary medicines			
% of current livestock	5	173	45

With:

n number of evaluators
x average value (%)
s standard deviation (%)