H. ENVIRONMENTAL ASSESMENT

1. Date — February 20 , 1997

2. Name of Petitioner — Japan Vilene Company , Ltd.

3. Address — 14-5 , Soto-Kanda , 2-Chome Chiyoda-ku
Tokyo , Japan

4. Description of Proposed Action

a. Usefulness of the absorbent pad for meat "Dripkeeper"

Recently, the distance between the locations of meat and poultry production and their consumption area has lengthened very much due to the development of vacuumpackaging by using shrinkable bags as a package of meat and poultry. Moreover, in terms of storage temperature, chilled storage has increased both from a view point of taste and due to an improvement of the means of transportation, in contrast to frozen storage so far.

In the stage of storage and transportation, exudate oozed from chilled meat and poultry increases in proportion to storage periods and deposits in the vacuumpacked bag, while no or little exudate is oozed from frozen meat and poultry. The storage under these conditions exerts undesirable effects on the freshness and taste of meat and poultry, and, in addition, it contaminates working environment of breaking seal and the following process, which comes into problems among traders of meat products.

The use of Dripkeeper has been developed as one of the effective means to eliminate these problems.

Dripkeeper is a composite packaging material, which consists of 4 components, super absorbent polymer (SAP), liquid impermeable film, synthetic paper, and pulp paper, respectively.

SAP, a major component of exudate absorbent, is sandwiched between liquid impermeable film and synthetic paper, so that it contacts indirectly with meat and poultry.

Dripkeeper has been developed to be used as a absorbent pad for meat for chilled, vacuumpacked meat and poultry.

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In comparison to the cellulose-based absorbent material such as plied tissue or fluff pulp, Dripkeeper has an advantage of the capacity of keeping exudate within a pad against external pressures being loaded, because absorbent sheet of Dripkeeper contains SAP. Dripkeeper has been developed for the purpose of storage and transportation of meat and poultry from meat manufacturer to meat packer, not intended to be used for general consumers such as meat stores or supermarkets.

b. Requested approval

Dripkeeper is applied to storage and transportation of chilled, vacuumpacked fresh meat and poultry described below by contacting its liquid impermeable film side directly with them.

examples: beef, pork, mutton, chicken, turkey

According to 21 CFR Part 171.1, and based on Articles of (b)(1) in Section 409 of Federal Food, Drug and Cosmetic Act, Dripkeeper is being applied as an indirect food additive.

c. Location of production

At present, Dripkeeper can be produced at two factories described below and, the petitioner, Japan Vilene Company, Ltd., is going to make a contract of processing on commission with each of these two factories.

(1)Best Products Company, Ltd.
address :356 Otu Oaza-Samata Takase-Cho
Sanpou-Gun, Kagawa, Japan

(2)Pascific Giken Company, Ltd.
address :1772-8 Yasu Yasu-Cho Yasu-Gun, Shiga,
Japan

Two factories described above are located at non-residental area in the suburbs of local cities.

The place of SAP production is the following factory located in the

western of the Harima-Rinkai-Kogyo-Chitai ,and faced Ibo-River and Setonai-kai .

Nippon Shokubai Co., Ltd. Himeji Plant
address :992-1 Aza-Nishioki Okihma Abosi-Ku Himeji, Hyogo, Japan

d. Location of use

Most of meat packers are located adjacent to meat manufacturers at local area, but some are located in urban area.

e. Location of disposal

Dripkeeper is removed in the stage of breaking seal of vacuumpacked. Dripkeeper sealed meat and poultry at meat stores, backyards of supermarkets, and retailers of these products.
Therefore, Dripkeeper is disposed of by general disposal routes such as incineration or landfilling as industrial wastes after use.

5. Identification of Chemical Substances that are the Subject of the Proposed Action

a. Chemical name and CAS registry number

Chemical names of four components contained in Dripkeeper are as follows.

Super Absorbent Polymer

1) Chemical name

Chemical Abstracts (9CI)

2-propenoic acid, polymer with 2-ethyl-2-(((1-oxo-2-propenyl)oxy)methyl)-1,3-propanediyl di-2-propenoate and sodium 2-propenoate

Trade name : AQUALIC CA

2) CAS registry number

76774-25-9

3) Molecular weight

Unable to determine because of crosslinked high molecular compounds

4) Structural formula

A structural formula representation together with formulation information is included in a confidential attachment (Refer to Appendix H-6).

5) Physical description

SAP is a white powder and swelled by water addition to form gel-like substance. Water absorbent capacity is from 100g/g to 500g/g for deionized water and 25g/g to 65g/g for 0.9% NaCl solution, respectively.

6) Impurities

On loading excess water beyond absorbent capacity of SAP, in case it is immersed in 8% ethanol solution of 1:1250 by volume for 10 days at 21° C for example, the extracts of 10.3% to 19.3% can be yielded. Most of the extracts are linear sodium polyacrylate oligomers.

Moreover, contents of heavy metals such as arsenic, lead, cadmium, mercury, chromium and so on are below detection limits. (Refer to Appendix H-1)

6. Introduction of Substances into the Environment

Production of Dripkeeper consists of laminating of components, sealing, cutting, and packaging, respectively, and therefore any hazardous environmental contaminants such as exhaust gas, liquid waste and so on are not discharged from this processing procedure.
In addition, SAP is diverted from those which manufactured for sanitary goods such as disposable diapers or sanitary napkins at Nippon Shokubai Co.Ltd. under Japan Environmental Act, therefore it seemed that no further effects of SAP itself arises.

The followings are the major standards expected to apply and disposal methods

a. Emissions standards and compliance at the SAP manufacturing facility

(1) Volatilized Acrylic Acid

Name of the Act expected to apply	Limitations
i)Air Pollution Prevention Act ii)Hyogo Prefectural Environmental Pollution Prevention Act iii)Himeji Municipal Environmental Pollution Prevention Act	There is no regulations on the quantitative limit or composition of volatilized acrylic acid.

(2)Air dust or suspended particulate matters

Name of the Act expected to apply	Limitations
i)Hyogo Prefectural Environmental Pollution Prevention Act ii)Himeji Municipal Environmental Pollution Prevention Act	Emissions Standards and Regulations of Hyogo Prefectural Environmental Pollution Prevention Act: Concentration at border line: 1.5mg/m^3 Concentration at the reachable point of the substance on the ground: 0.5mg/m^3

The bag filters have been used in compliance with these emissions standards.

b. Emissions standards and disposal methods at SAP manufacturing facility

Name of the Act expected to apply	Limitations
i)Water Pollution Prevention Act ii)Hyogo Prefectural Environmental Pollution Prevention Act iii)Himeji Municipal Environmental Pollution Prevention Act	Biochemical oxygen demand (BOD): 40(30)mg/l Chemical oxygen demand (COD): 35(25)mg/l Total suspended solids in water (SS): 80(60)mg/l n-Hexane extractable materials Mineral oil: 2mg/l Animal and plant oils, fats: 15mg/l Phenol content: 1mg/l Dissolved Iron: 3mg/l Each value without parentheses represents daily maximum limit and values with parenthesis represent daily mean.

The activated sludge method has been used in compliance with these emissions standards.

c. Disposal of solid waste emitted from SAP manufacturing facility

After giving notice to the authorities concerned, solid waste emitted from manufacturing facility is taken by an authorized industrial waste disposal manufacturer and disposed of by incineration.

7. Fate of Emitted Substances in the Environment

As described in Section 4.a., removal of Dripkeeper from package of chilled, vacuumpacked meat and poultry occurs only at the stage of breaking down and repackaging process which is carried out by meat packers and not by general consumers such as household. Therefore,

Dripkeeper is disposed of by incineration or landfilling as industrial wastes after use.
The fate of Dripkeeper disposed of by each case is described as follows.

a. Incineration

Among 4 components of which Dripkeeper consists, liquid impermeable film (Olefin polymers), synthetic paper (Polyethylene phthalate and Olefin polymers), and pulp paper are generally regarded as incinerable materials.
SAP, the remainder of 4 components, is degraded into carbon dioxide and water by incineration, therefore a generation of hazardous gas seems to be negligible as shown in attached document H-2.
In addition, a heat generation from SAP is about 3000 cal/g, which is little higher than that of municipal trash, so that this article may give little damage to incinerator.
From these data described above, the disposal of SAP by incineration seems to exert little impacts on the environment.
Disposal by incineration of useless or used SAP is also most desirable.

B .Landfilling

Among the components of Dripkeeper, pulp paper is biodegradable and contains no contaminants for the environment.
Liquid impermeable film and synthetic paper consist of non-biodegradable components in soil so that they are very stable in the environment and do not discharge any hazardous contaminants to the environment.
SAP is also a stable substance because it is degraded little by microorganisms as shown in table 2 of Appendix H-2.
These data mean that each component is very stable in soil as sand in soil. and diffuses little in water.
Therefore. Dripkeeper as a whole does not seem to exert any impacts on the environment when it is disposed of by landfilling.

8. Environmental Effects of Released Substances

There are no exhaust gas or liquid wastes generated at the site of Dripkeeper production as described in Section 6. Also, there is few substances discharged to the environment on disposal by incineration or landfilling. It seems to be hard to estimate that SAP might exert an environmental contamination judged from its toxicity, even if it gives a little eluates.

Acute oral toxicity of SAP is beyond 2000mg/kg for both rats and mice, which corresponds to the maximum dose level and unable to administer anymore since SAP is swelled. SAP has been demonstrated as a safe substance in subacute oral toxicity, primary skin irritation, cumulative skin irritation, contact skin sensitization, patch test, mutagenicity, and teratogenicity, respectively.

(Refer to TOXICITY STUDIES in Petition E-2)

9. Use of Resources and Energy

The total livestock products in U.S.A in 1995 was calculated 33,468kt and production of beef, pork and chicken were 11,585kt, 8,097kt and 13,786kt, respectively.(Refer to Appendix H-3)

Provided that at most one-third of total livestock products are converted to chilled meat and poultry consumed, and also provided that a sheet of Dripkeeper S=2 (contains 3.1g SAP/sheet) is used for all meat and poultry in every 3 kg of them, then the maximum annual consumption of Dripkeeper is estimated at 3,718 millions of sheets.

33,468 (kt) × 1/3 ÷ 3 (kg/sheet) = 3,718 millions (of sheets)

Therefore , the total consumption of SAP as the primary component of the final food packaging material is estimated at 11,526 t.

3.1 (g/sheet) × 3,718 millions (of sheets) = 11,526 t.

On the other hand, SAP of this kind is also used for disposable diapers and sanitary napkins as shown in Table 1, where 219kt of SAP have been produced in 1995 in U.S.A.

Table 1. United States Super Absorbent Polymer Demand

(kt)

End-Use	1993	1994	1995	1996	1997	1998	1999	2000
Infant Diaper	112	168	184	189	198	206	215	215
Training Pants	7	9	12	12	13	13	14	14
Incontinence	9	11	15	16	17	18	20	21
Sanitary Napkin	2	2	2	2	2	2	2	2
Food Packaging						1	1	1
Cable		1	1	1	1	1	1	1
Medical	1	1	1	1	2	2	2	2
Other Industrial	2	2	3	3	3	4	4	4
Agriculture	2	2	2	2	2	2	2	2
United States	135	196	219	226	238	249	261	262

Information regarding Comparative consumption of Dripkeeper with fluff pulp based pads (Refer to Confidential Appendix H-5).

10. Mitigation Measures

There seems to be no need for mitigation since any component of Dripkeeper exerts little impacts on the environment.

11. Alternatives to the Proposed Action

Alternatives to the proposed action seems unnecessary because of Dripkeeper's little impacts on the environment.

12. List of Prepares

Tadashi Murakami
Senior Staff
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Japan Vilene Company , Ltd.
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Terukuni Hashimoto
General Manager
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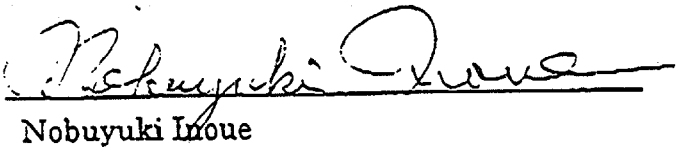
Nippon Shokubai Company , Ltd.
Professional discipline : Synthetic Polymer Chemistry

13. Certification

The undersigned official certifies that the information presented is true, accurate, and complete to the best of the knowledge of the firm or agency responsible for preparation of the environmental assessment.

Date: February 20 , 1997

Signature of responsible official



Nobuyuki Inoue
Manager
Planning & Medical Regulatory Affairs Group
Medical & Consumer Materials Sales Dept.
Japan Vilene Company , Ltd.

14. Appendix

H-1)Certificate on the result of purity test of water absorbing Sheet

H-2)The safety and the environmental influence of the super absorbent Polymer: Research and Development Society for Super Absorbent Polymer,1996

H-3) Livestock and Poultry: World Market and Trade(Circular Series FL&P 2-96):USDA,1996,p95,p103,p126

CONFIDENTIAL

H-4) Superabsorbent Product Developments and Markets: Bernard J.Obenski International Research Associates,1996,pp.1-5

H-5) Comparative consumption of Dripkeeper with fluff pulp based pads

H-6) Structural formula - Formulation

APPENDIX H-1

JAPAN FOOD HYGIENE ASSOCIATION

6-1, JINGUMAE 2-CHOME, SHIBUYA-KU, TOKYO.

CERTIFICATE

No. 41-5980 Date : December 19, 1994

Name and Address of Applicant : JAPAN VILENE COMPANY, LTD.
14-5, SOTO-KANDA 2-CHOME, CHIYODA-KU, TOKYO 101, JAPAN

Article examinated : Absorbent polymer sheet

Item(s) of Examination : Test for arsenic, lead, cadmium, mercury (total) and chromium (total)

Result(s) of Examination :

Arsenic (as As_2O_3)	:	not detected (less than 0.2 ppm)
Lead	:	not detected (less than 0.5 ppm)
Cadmium	:	not detected (less than 0.1 ppm)
Mercury (total)	:	not detected (less than 0.05 ppm)
Chromium (total)	:	not detected (less than 0.5 ppm)

I hereby certify that the result(s) of examination obtained according to our analysis was as stated above.

Shigeo Satake

Shigeo Satake
Managing Director
Institute of Food Hygiene
Japan Food Hygiene Association

(Authorized by Ministry of Health and Welfare)

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APPENDIX H-2

(English Translation)

The Safety and the Environmental Influence of the Super Absorbent Polymer

Research and Development Society

for Super Absorbent Polymer*

February, 1995

* The society dissolved better, and, at present, the organization has been shifted over "Japan Superabsorbent Polymers Industry Association" established May, 1995.

Safety of Super absorbent polymer and its Influence on the Environment

Table of Contents

1. Super absorbent polymer

1.1 What is super absorbent polymer?

Super absorbent polymer(SAP) is the resin which absorbs water and swells to become tens to a thousand times as large as its original weight when it is in contact with water and which does not discharge water even with a certain pressure applied.

Chemically, Super absorbent polymer is expressed as slightly crosslinked polyacrylic light metal salt. The wording of "crosslinked sodium polyacrylate " is mainly used in this pamphlet.

Major descriptions of super absorbent polymer are as follows:

Appearance : Occurs as white powder, almost odorless and has no taste

Water solubility : Swells after absorbing water, but practically insoluble

Solubility in organic solvent : Practically insoluble

Melting point: Higher than 200°C(degraded)

1.2 Use of super absorbent polymer

Super absorbent polymer is mostly used as sanitary materials (such as paper diapers and sanitary items). With its features utilized, use of super absorbent polymer has been extended to public work materials (such as sealing material and sludge caking agent) and food distribution materials (such as cold reserving material and drip absorber).

1.3 Safety of super absorbent polymer and its influence on the environment - Summary

This pamphlet examines the safety of super absorbent polymer and its influence on the environment and the outline of our examination is stated below (for further details see next page onward).

Super absorbent polymer is a crosslinked polymer. Since its molecular weight is so large that it cannot be absorbed into an organism, and its toxicity is considered weak. However, in handling of super absorbent polymer care must be taken not to swallow its powder.

Since it is an organic compound, incineration is desirable as a means to dispose it. However, even if it flows out to water system after being buried, its influence on the environment is quite small.

2. Safety of super absorbent polymer

Super absorbent polymer is a crosslinked polymer. Because of the extremely large molecular weight, it is not absorbed into an organism and the toxicity is considered to be low.

Results of safety assessment studies, which were performed by the member companies of Research and Development Society for Super Absorbent Polymer, are shown in Table 1, and its low toxic profiles have been confirmed.

Mild irritating effects were observed in the eye irritation test, however, these effects are not considered due to its chemical nature but due to physical stimulation as a solid substance or due to its water absorbable potentials. When gelatinized with distilled water, no irritating effects are observed.

Experimental results in the laboratory animals for the pulmonary effects of the inhaled powder of super absorbent polymer were reported as below (Literature 1):

Grounded micro powder of particle size of 3-4 μm was inhaled to hamsters at dose of 0.3, 1.0 or 10 mg/m^3 for 6 hours per day, for 28 days. No inter-group differences were observed for the systemic health conditions and body weight changes. The foreign bodies were detected in the lung dose-dependently in the animals sacrificed immediately after inhalation. However, a majority of the foreign bodies had been excluded from the lung in the animals sacrificed at 4 weeks after termination of inhalation. Inflammatory cell reactions were observed at termination of the inhalation period though it was not significant. However, these reactions seemed to reduce during the recovery period.

The particle size of the super absorbent polymers on the

market are large, and, therefore, it is considered that only a few particles will reach to the alveolus. However, it is better to avoid to inhale the powder of super absorbent polymer.

As shown above, toxicity of super absorbent polymer is low, and it is considered that there are no toxicological problems in the environment after it absorbed water. However, with respect to the industrial hygiene, it is desirable to use a safety spectacles and a dust respirator for handling the powder.

Table 1. Summary of results of safety assessment studies on super absorbent polymer

Study	Animal	Preparation method of test substances	Outline of experimental method	Results
Oral acute toxicity study	Rat	0.5 g/ml in peanuts oil	Administered at dose of 5 g/kg and observed for 2 weeks	LD_{50} > 5000 mg/kg
Oral subacute toxicity study	Rat	2.5%(w/v) in corn oil	Administered at dose of 250 mg/kg/day, once a day, for 28 days. General condition, body weight, hematological examination, autopsy and pathology	No abnormal effects were observed
Primary skin irritation test	Rabbit	0.5 g + 0.5 ml of distilled water	Six rabbits were used. Semi-occlusive application for 4 hrs to the normal skin only	No irritability (PII=0.0)
		10%(w/w) in distilled water	Six rabbits were used. Occlusive application for 24 hrs to the normal and abraded skin	No irritability (PII=0.0)
Multiple skin irritation test	Rabbit	2%(w/w) in physiological saline	Six rabbits were used. Topical application for 24 hrs per day for 14 days to the normal skin only	No irritability (whole period: PII=0.0)
		10%(w/w) in distilled water	Semi-occlusive application for 24 hrs per day for 14 days	No irritability (whole period: PII=0.0)
Human patch test	Human	2%(w/w) in distilled water	By Kawai's method (20 volunteers, semi-open application for 24 hrs to the normal skin only)	Semi-negative
Skin sensitization test	Guinea pig	Sensitization by intradermal injection: 5%(w/v) in peanuts oil Sensitization by topical application: 75%(w/v) in peanuts oil or 10%(w/w) in distilled water Challenging: 75%(w/v) in peanuts oil or 5%(w/w) in distilled water	M&K maximization method, 20 animals in the test group and 10 animals in the control group	No sensitizing potentials
Eye irritation test	Rabbit	Base compound	Six animals were used	Mild irritability
		10%(w/w) in distilled water	Six animals were used	No irritability
Irritation test using mucosal membrane of vagina	Dog	Base compound, 2%(w/v) in physiological saline	Two animals were used, 24 hrs x one time Two animals were used, 24 hrs x 20 times	No irritability No irritability
Mutagenicity		Suspension in DMSO	Maximum concentration is 5 mg/plate, 4 strains of S. typhimurium and one strain of E. coli	Negative

3. Influence of super absorbent polymer on the environment

After being used in various ways, super absorbent polymer is incinerated or landfilled in soil and then released into the environment.

Figure 1 indicates the behavior of super absorbent polymer in possible environments. Means of disposing super absorbent polymer may be roughly classified into the following three cases: incineration, burial, and flowout into water systems such as rivers. Effects of super absorbent polymer are summarized as follows relative to the three cases:

1) In the case of incineration:

In case super absorbent polymer is incinerated, usually it generates CO_2 and water through heat degradation with no specific harmful gas is observed (see Document 2).

The calorific value is approx. 3,000 cal/g which is a little higher than the case of city garbage. Damage of a furnace caused by high temperature is relatively small (see Document 2).

From the above, it may be concluded that the influence of super absorbent polymer on the environment is quite small. In other words, the best way of disposing unnecessary or used super absorbent polymer is incineration.

2) In the case of landfilling:

Little biodegradation is observed when super absorbent polymer of crosslinked sodium polyacrylate system is landfilled in soil (See Table 2) and, therefore, it may be concluded that super absorbent polymer remains fairly

stable in case of contact with micro-organism.

Just like pebbles and sand in soil, it does not elute into water and contamination of underground water with super absorbent polymer may not be taken into consideration.

3) In the case of flowing out to water system:

With long-chained polymer molecules are crosslinked in it, super absorbent polymer is not dissolved in water but remains stable basically. However, when it is exposed to the sunlight, especially to ultraviolet, it is gradually degraded with crosslinks cut, and becomes uncrosslinked (long-chained) water soluble sodium polyacrylate.

When it becomes uncrosslinked water soluble sodium polyacrylate, just like in the case of polymer plasticizer which is produced in large quantity in Japan, it adheres to soil particles or the surface of sludge, and it is removable in this way (see Table 2). In Japan uncrosslinked sodium polyacrylate has been permitted as a food additive. Although it is produced in large quantity in Europe as a detergent builder, no specific problem has arisen. Also from the test data on safety, super absorbent polymer may be considered to have a high degree of safety (see Table 3).

When photodegradation further makes progress, molecular chain of uncrosslinked sodium polyacrylate is cut off, and its molecular weight is reduced. Super absorbent polymer is known to be degraded up to molecular weight of approximately 1,000 (Literature 2). Uncrosslinked sodium polyacrylate of 1,000 molecular weight and under is generally biodegraded with micro-organism

(Literature 2 and 3).

From the above, it may be concluded that super absorbent polymer of crosslinked sodium polyacrylate system has an exceedingly small effect on the environment when it is disposed either by means of incineration, landfilling in soil, or flowout into water system.

Figure 1

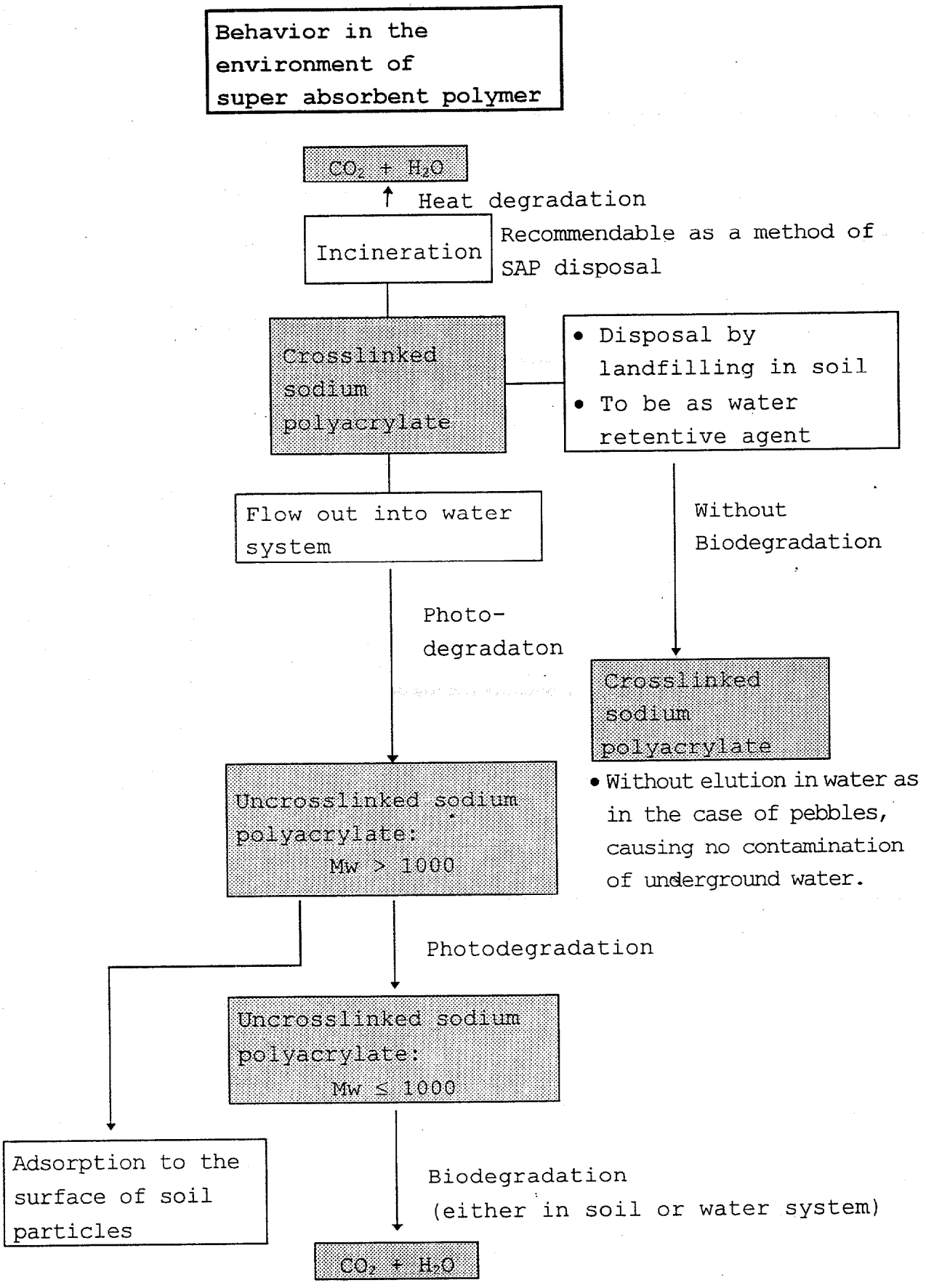


Table 2 Behavior of super absorbent polymers and the degradations in the environment

	Bridged sodium polyacrylate (commercial product)	Unbridged sodium polyacrylate (Mw > 1000)	Unbridged sodium polyacrylate (Mw ≤ 1000)	Acrylic acid
Photo-degradation	• The resin is degraded easily cleaving the conjugation resulting in water soluble macro molecule of sodium polyacrylate. (Document 1)	• Regardless to the initial molecular weight, the resin is degraded to the molecular levels of approximate 1000. (Literature 2) • The higher concentration in the aqueous solution, the faster degraded the polymer is to the low molecular compounds. (Literature 2)	• Not easily degraded	• Not easily degraded (Literature 4)
Biological degradation in the aqueous environment as in the river	• The resin is gradually degraded by lights	• High molecular polymers are not easily degraded. (Literature 3) • By the activated sludge treatment, 90% or more of the resin can be removed by contact to the activated sludge or by precipitation as Ca-salt. (Literature 3)	• The resin of which molecular is less than 1000 is degraded biologically. (Literature 3) • Approximate 50% of oligomer of 6-10 polymer were degraded during 2 months by the activated sludge treatment at a sewer management site. (Literature 1)	• Easily degraded (literature 4)
Biological degradation in soil	• The resin is principally not degraded in soil. The resin is not dissolved into the soil, no contamination would occurred into the underground water as in the case of pebbles.	• The resin is hardly degraded biologically in soil. (Literature 3) • Macromolecule sodium polyacrylate, which receives no biological degradation, is reabsorbed on the surface of soil since it has carboxyl base, charged in minus, in its molecule. Then the resin causes no contamination in the underground water. (Literature 3)	• Ninety-five % of the resin of which molecular is less than 1000 was degraded to the inorganic components after 5 months. (Literature 3) • It is known that a certain bacteria of Arthrobacter isolated from soil can decompose 70-80% of the oligomer during 1-2 weeks. (Literature 2)	• Degraded (literature 4)
Combustion	• The resin can be burnt as the combustible city waste. • Analysis of the combustion gas revealed no existence of the hazardous gases. • Combustion calorie is approximate 3000 cal/g. (Document 2).	Same as in the left column	Same as in the left column	

Table 3 Safety of super absorbent polymer and the degradation product

	Bridged sodium polyacrylate	Unbridged sodium polyacrylate (MW > 1000)	Unbridged sodium polyacrylate (MW ≤ 1000)	Acrylic acid
Source	Table 1 & Literature 5	Literature 3		Literature 4
Acute oral toxicity	LD_{50} > 5000 mg/kg(rat)	LD_{50} > 5000 mg/kg(rat)	Although no investigation was performed, it is considered that there is no problem for the safety of this compound based on the following reasons; The resin of which molecular weight is more than 600 has no permeability through the biological membrane (Literature 3), therefore, the toxicity of this resin is considered to be very low similar to those of the high molecular resin (Mw>1000). Since low molecular resins are degraded biologically, the concentrations in the environment become low and no significant toxicity is resultant.	LD_{50}: 340-2590 mg/kg(rat)
Subchronic oral toxicity	No abnormalities were detected in rats treated at dose of 250 mg/kg/day for 28 days.	Rats were treated at dose of 2.5% in the diet for 28 days. No effects were observed on general condition and body weight gains. In the bone and plasma, Mg concentration decreased and Ca-loss increased. These changes were considered not to be attributed to the toxicity of the resin but due to the excess incorporation of sodium.		Rats were treated with the compound mixed in the drinking water for 90 days. Maximum no-effect dose level: 83 mg/kg/day
Mutagenicity	Negative in Ames test and other tests (Literature 5)	Negative in Ames test and other tests.		Negative in Ames test. Positive results were obtained in other tests.
Absorption & metabolism		Hardly absorbed through the digestive gut.		
Effects on aquatic organism		Zebra fish: LC_{50} > 200 mg/l at 96 hrs Water flea: EC_{50} > 200 mg/l at 48 hrs Accumulation: It is considered to be low.		Rainbow trout: LC_{50}: 27 mg/l at 96 hrs Water flea: EC_{50}: 95 mg/l at 48 hrs Algae: EC_{50}: 0.17 mg/l at 96 hrs Accumulation: It is considered to be low.
Effects on organisms in soil		Earth worm: LC_{50} > 1000mg/kg-soil Effects on the growth of plants: No effects were observed at dose of 225 mg/kg-soil (maximum concentration tested)		No effects were observed on the respiration of bacteria in soil at dose of 100 ppm. The respiration is completely disturbed at 1000 ppm.

4. Precaution for handling of super absorbent polymer product

In handling of super absorbent polymer, pay attention to the following:

4.1 Precaution for handling and custody of super absorbent polymer

a) Handling : Be careful not to inhale dust. Wear a dust respirator, safety spectacles, and protective gloves.

b) Custody : Seal the containers and store them in a general warehouse. Avoid placing them in a place of high temperature or high humidity.

4.2 Emergency measure

a) First-aid treatment

In case of contact with eyes:
Wash the relevant eye with fresh water for at least 15 minutes. If abnormal feeling remains, see an ophthalmologist.

After contact with skin:
Wash the portion sufficiently with fresh water.

In case inhaled:
Move the person to place of fresh air. See a doctor depending on symptoms.

In case swallowed:
Drink water after gargling.

b) Measures against leakage

Clean the leakage with a vacuum cleaner, etc.

Collect the leaked substance into an empty container and throw it away.

c) Measures against a fire

Extinguish the fire with water or a fire extinguisher.
(Fire extinguishing agent: water, air foam, powder, carbon dioxide)

4.3 Method of disposal

To be incinerated in principle.

5.Documents and literature

Document 1: Photodegradability of super absorbent polymer

Document 2: Report of incineration test result on super absorbent polymer

Literature 1: James J. McGraft et al., 28-day Inhalation Study of a Cross-linked Polyacrylate Superabsorbent in the Hamster, Journal of Applied Toxicology, Vol.14(4),269-273(1994)

Literature 2: T.Hayasi,M.Mukouyama, Y.Tani, Biodegradability of poly(Sodium Acrylate), Polymer Preprints,Japan,Vol.42(6),2178-2180(1993)

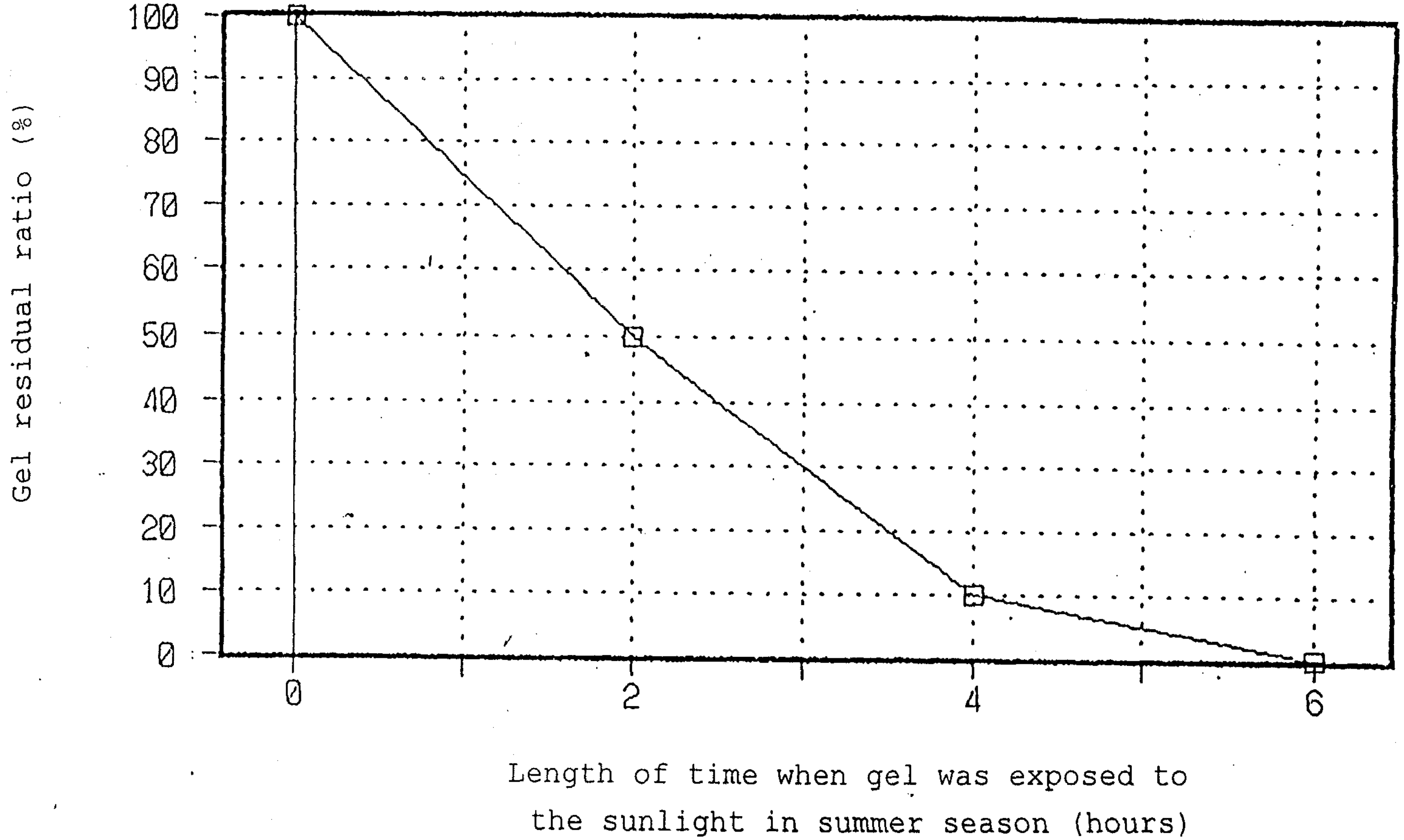
Literature 3: ECETOC Joint Assessment of Commoditym Chemicals No.23,Polycarbonate Polymers as used in Detergents, November 1993

Literature 4: Health Effect Assessments of the Basic Acrylates, edited by Tipton R.Tyler et al., CRC Press Inc. 1993

Literature 5: E.D.Thompson et al. Lack of Genotoxicity of Cross-Linked Acrylate Polymers in Four Short-Term Genotoxicity Assays, Environmental and Molecular Mutagenesis 18:184-199(1991)

Document 1: Photodegradability of super absorbent polymer

Gel having absorbed water was exposed to the sunlight for a certain length of time and the portion dissolved was separated using a metal net.



Document 2: Incineration Test Result of Super absorbent polymer
(Outline)

1. Samples
   Sample A: Super absorbent polymer (crosslinked sodium polyacrylate)
   Sample B: Uncrosslinked sodium polyacrylate

2. Tests
   1) Measurement of total calorific value
   2) Qualitative analysis of gas generated at the time of combustion

3. Analysis methods
   1) Measurement of total calorific value
      Automatic bomb calorie meter for combustion research
   2) Qualitative analysis of the gas generated at the time of combustion
      Combustion temperature: 800°C
      Method of analyzing the gas generated:
      Analysis of infrared ray absorption and GC - MS

4. Test result
   1) Total calorific value: Sample A: 3,040 cal/g
      Sample B: 2,730 cal/g
   2) Gas generated:
      Main components of the gas generated from both Samples A and B were hydrocarbon of low molecular such as carbon dioxide, carbon monoxide, and ethylene.

5. Testing facility: Juka Analysis Center Co., Ltd.

6. Date of reporting test results: November 2 & 18, 1994

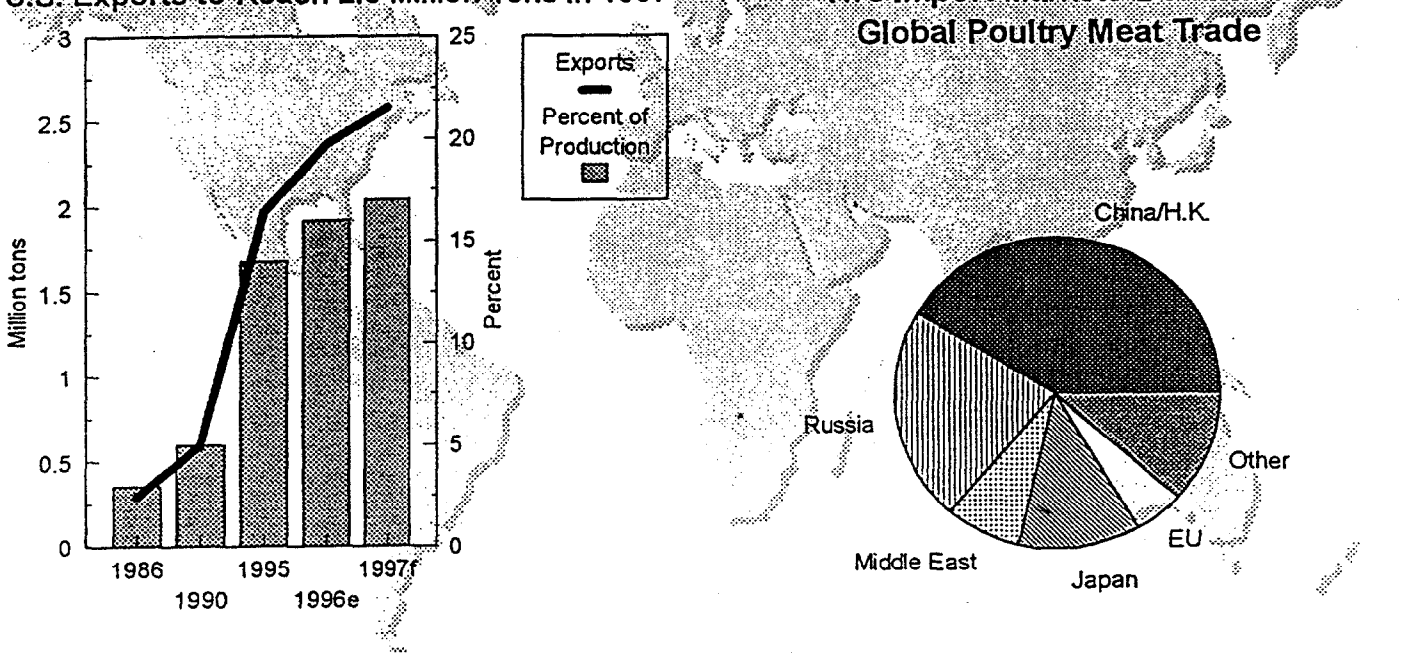
United States Department of Agriculture

Foreign Agricultural Service

Circular Series FL&P 2-96 October 1996

Livestock and Poultry: World Markets and Trade

U.S. Poultry Meat Exports Continue Record Setting Performance



001629

Approved by the World Agricultural Outlook Board-USDA

001629

BEEF AND VEAL PRODUCTION
Selected Countries

1,000 Metric Tons
Carcass Weight Equivalent

	1992	1993	1994	1995	(p)1996	(f)1997
NORTH AMERICA						
Canada	898	860	903	928	1,025	1,120
Mexico	1,660	1,710	1,810	1,850	1,800	1,800
United States	10,613	10,584	11,194	11,585	11,814	12,032
Subtotal	13,171	13,154	13,907	14,363	14,639	14,952
CARIBBEAN						
Dominican Republic	44	45	46	48	49	50
CENTRAL AMERICA						
Costa Rica	84	93	94	93	93	92
El Salvador	23	25	27	27	26	26
Guatemala	52	53	48	50	53	54
Honduras	44	44	45	29	28	29
Nicaragua	50	52	54	50	49	49
Subtotal	253	267	268	249	249	250
SOUTH AMERICA						
Argentina	2,520	2,550	2,600	2,600	2,550	2,500
Brazil	4,420	4,545	4,550	4,750	4,960	5,150
Colombia	630	563	566	604	617	637
Uruguay	365	309	368	344	370	390
Venezuela	365	377	370	347	354	354
Subtotal	8,300	8,344	8,454	8,645	8,851	9,031
EUROPEAN UNION						
Austria	239	216	212	196	190	192
Belgium–Luxembourg	361	375	356	356	325	335
Denmark	217	200	190	188	186	184
France	1,831	1,704	1,588	1,640	1,640	1,650
Germany	1,826	1,575	1,447	1,407	1,438	1,380
Greece	80	80	83	85	86	88
Ireland	565	484	445	480	500	512
Italy	1,220	1,190	1,170	1,181	1,000	1,100
Netherlands	635	611	603	580	490	490
Portugal	127	116	122	105	94	101
Spain	539	488	478	508	485	500
Sweden	127	140	141	144	142	139
United Kingdom	959	863	918	976	740	750
Subtotal	8,726	8,042	7,753	7,846	7,316	7,421
OTHER WESTERN EUROPE						
Switzerland	165	155	142	147	139	138
EASTERN EUROPE						
Bulgaria	122	123	95	87	94	69
Czech Republic	403	374	345	323	318	315
Poland	634	462	405	400	408	415
Romania	305	172	170	150	175	180
Subtotal	1,464	1,131	1,015	960	995	979
FORMER SOVIET UNION						
Kazakhstan, Republic of	596	662	642	546	450	385
Russian Federation	3,632	3,380	3,071	2,801	2,633	2,400
Ukraine	1,654	1,379	1,421	1,158	1,007	940
Subtotal	5,882	5,421	5,134	4,505	4,090	3,725
MIDDLE EAST						
Saudi Arabia	28	29	30	26	20	20
Turkey	550	566	574	623	609	609
Subtotal	578	595	604	649	629	629
NORTH AFRICA						
Egypt	410	364	392	402	430	450
OTHER AFRICA						
South Africa, Republic of	745	691	581	542	548	580
SOUTH ASIA						
India	935	945	1,050	1,230	1,290	1,345
OTHER ASIA						
China, Peoples Republic of	1,803	2,337	3,270	4,154	4,400	4,700
Japan	592	593	602	601	585	570
Korea, Republic of	137	176	200	214	233	256
Philippines	131	133	135	139	148	157
Taiwan	5	5	5	6	6	6
Subtotal	2,668	3,244	4,212	5,114	5,372	5,689
OCEANIA						
Australia	1,838	1,806	1,829	1,717	1,775	1,862
New Zealand	518	575	566	630	616	587
Subtotal	2,356	2,381	2,395	2,347	2,391	2,449
TOTAL	45,697	44,779	45,953	47,047	46,988	47,688

SOURCE: Counselor and attache reports, official statistics, and results of office research.

(p)–preliminary (f)–forecast

Foreign Agricultural Service
Commodity and Marketing Programs
Dairy, Livestock, and Poultry Division

PORK PRODUCTION
Selected Countries

1,000 Metric Tons
Carcass Weight Equivalent

	1992	1993	1994	1995	(p)1996	(f)1997
NORTH AMERICA						
Canada	1,209	1,192	1,234	1,281	1,245	1,275
Mexico	830	870	900	954	890	890
United States	7,817	7,751	8,027	8,097	7,804	7,955
Subtotal	9,856	9,813	10,161	10,332	9,939	10,120
SOUTH AMERICA						
Brazil	1,200	1,250	1,300	1,450	1,520	1,580
EUROPEAN UNION						
Austria	401	413	471	457	464	468
Belgium–Luxembourg	937	988	1,011	1,044	1,081	1,068
Denmark	1,383	1,527	1,565	1,517	1,530	1,560
France	1,994	2,034	2,126	2,148	2,160	2,200
Germany	3,124	3,180	3,030	3,062	3,020	3,000
Greece	153	150	144	147	149	151
Ireland	203	213	215	206	205	213
Italy	1,342	1,371	1,369	1,345	1,355	1,360
Netherlands	1,584	1,750	1,673	1,623	1,560	1,560
Portugal	234	284	344	305	308	301
Spain	1,918	2,088	2,107	2,175	2,100	2,200
Sweden	277	291	307	310	315	304
United Kingdom	983	1,025	1,053	1,017	995	1,035
Subtotal	14,533	15,314	15,415	15,356	15,242	15,420
OTHER WESTERN EUROPE						
Switzerland	264	260	246	251	224	215
EASTERN EUROPE						
Bulgaria	312	265	267	265	251	238
Czech Republic	699	685	655	650	660	710
Hungary	570	500	494	400	690	725
Poland	2,052	1,537	1,358	1,580	1,520	1,400
Romania	491	373	565	421	432	440
Subtotal	4,124	3,360	3,339	3,316	3,553	3,513
FORMER SOVIET UNION						
Russian Federation	2,784	2,432	2,260	1,896	1,744	1,640
Ukraine	1,180	1,013	916	807	767	770
Subtotal	3,964	3,445	3,176	2,703	2,511	2,410
OTHER ASIA						
China, Peoples Republic of	26,353	28,544	32,048	36,484	36,400	36,000
Hong Kong	223	214	199	10	9	9
Japan	1,432	1,433	1,390	1,322	1,260	1,230
Korea, Republic of	752	773	786	799	877	870
Philippines	710	690	715	754	798	825
Singapore	83	85	87	85	83	80
Taiwan	1,113	1,135	1,204	1,233	1,270	1,275
Subtotal	30,666	32,874	36,429	40,687	40,697	40,289
OCEANIA						
Australia	336	328	344	351	337	348
TOTAL	64,943	66,644	70,410	74,446	74,023	73,895

SOURCE: Counselor and attache reports, official statistics, and results of office research.

(p)–preliminary (f)–forecast

Foreign Agricultural Service
Commodity and Marketing Programs
Dairy, Livestock, and Poultry Division

TOTAL POULTRY MEAT PRODUCTION

Selected Countries
(1,000 Metric Tons in Ready-to-Cook Equivalents)

	1992	1993	1994	1995	(p) 1996	(f) 1997
NORTH AMERICA						
Canada	706	741	829	836	853	862
Mexico	990	1,090	1,240	1,120	1,145	1,210
United States	11,885	12,396	13,206	13,786	14,580	15,252
Subtotal	13,581	14,227	15,275	15,742	16,578	17,324
SOUTH AMERICA						
Argentina	590	630	675	700	660	680
Brazil	2,932	3,211	3,491	4,140	4,130	4,510
Colombia	353	497	514	537	591	633
Guatemala	73	85	95	104	110	116
Honduras	35	39	40	41	41	41
Venezuela	333	350	365	410	406	402
Subtotal	4,316	4,812	5,180	5,932	5,938	6,382
EUROPEAN UNION						
Belgium-Luxembourg	189	196	219	251	264	259
Denmark	158	162	172	168	170	175
France	1,866	1,875	1,961	2,079	2,180	2,255
Germany	604	615	641	655	657	662
Greece	175	173	175	178	179	181
Ireland	84	88	97	101	105	106
Italy	1,057	1,061	1,084	1,123	1,168	1,158
Netherlands	577	565	594	641	658	669
Portugal	237	238	248	235	247	247
Spain	867	840	880	910	920	920
United Kingdom	1,276	1,244	1,289	1,330	1,372	1,408
Subtotal	7,090	7,057	7,360	7,671	7,920	8,040
EASTERN EUROPE						
Hungary	320	307	320	368	365	370
Poland	336	300	345	367	380	390
Romania	190	160	135	160	180	200
Subtotal	846	767	800	895	925	960
FORMER SOVIET UNION						
Russia	1,428	1,277	1,142	893	822	780
Ukraine	498	362	265	235	212	212
Subtotal	1,926	1,639	1,407	1,128	1,034	992
MIDDLE EAST						
Israel	206	224	242	249	251	256
Kuwait	9	18	18	20	22	24
Saudi Arabia	275	285	286	309	340	438
Turkey	330	350	330	390	435	475
United Arab Emirates	15	16	18	20	21	22
Subtotal	835	893	894	988	1,069	1,215
AFRICA						
Egypt	271	295	345	360	380	390
Republic of South Africa	673	641	667	736	789	830
Subtotal	944	936	1,012	1,096	1,169	1,220
ASIA						
China (PRC)	4,540	5,736	7,550	9,347	11,000	12,500
Hong Kong	21	20	16	21	20	18
Japan	1,367	1,368	1,258	1,282	1,260	1,250
Republic of Korea	354	369	378	415	425	435
Singapore	57	62	57	60	61	62
Taiwan	531	585	604	630	655	655
Thailand	710	685	740	825	875	915
Subtotal	7,580	8,825	10,603	12,580	14,296	15,835
OCEANIA						
Australia	455	467	498	500	503	510
Subtotal	455	467	498	500	503	510
TOTAL	37,573	39,623	43,029	46,532	49,432	52,478

SOURCE: FAS post reports, official statistics, and inter-agency analysis.

(p) preliminary (f) forecast

Foreign Agricultural Service
Commodity and Marketing Programs
Dairy, Livestock and Poultry Division