Sustainable Management of Natural Resources in Central Vietnam

SMNR-CV

Report

Market and Quality Assessment of Pepper in Vietnam

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gtz

GFA Consulting Group

Table of Contents

PRODUCTION, CONSUMPTION PROCESSING AND EXPORTING OF PEPPER IN VIETNAM

1. PRODUCTION AND CONSUMPTION OF PEPPER

1.1 Pepper production and consumption in the world

Pepper is one of the industrial plants of high economic and exporting value. On the world market, pepper products are traded in the different forms as follows: black pepper, white pepper, green pepper and oleoresin.

Pepper has been produced since the twentieth century. The world demand for pepper has incessantly increased while pepper plantation is only suitable in the tropical regions. For this reason, pepper is the most important exporting agricultural product of some African and Asian countries.

In the past, India, Indonesia and Brazil were the leading countries of pepper production in the world. Since 1990, Vietnam has joined the world market of pepper export with the market share of 6% and has a strong continuous increase in the pepper production. To date, Vietnam has become the biggest country of pepper export in the world. In 2006 Vietnam exported 118,618 tons of pepper, occupying 60% of the world pepper output for exporting (source cited by IPC).

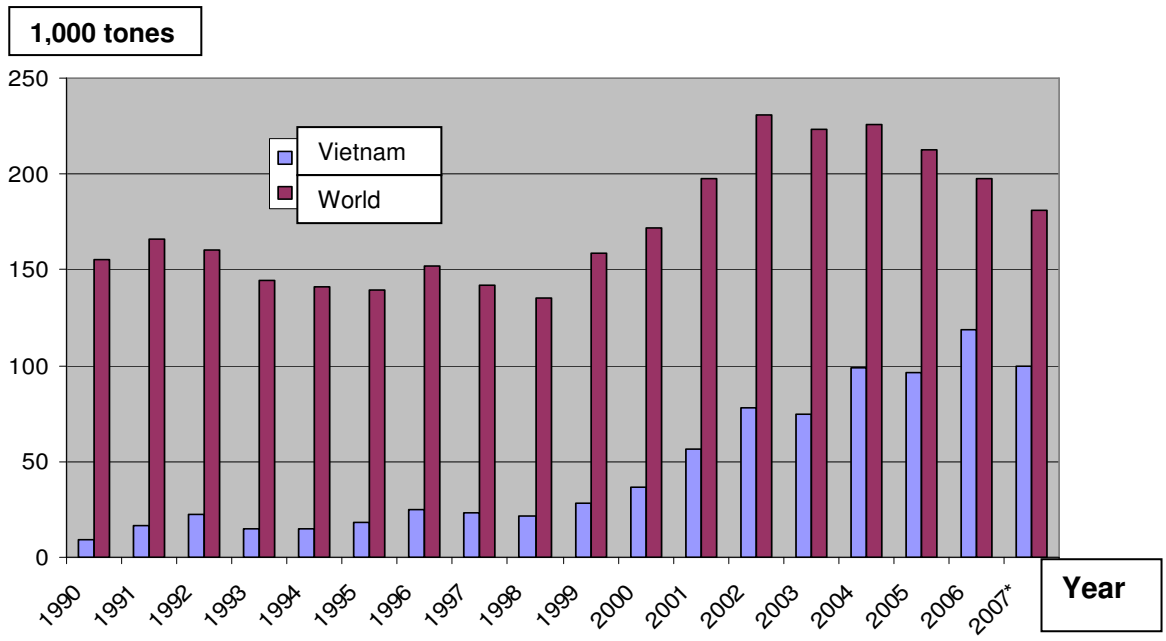


Diagram 1: Exported pepper of the world and Vietnam

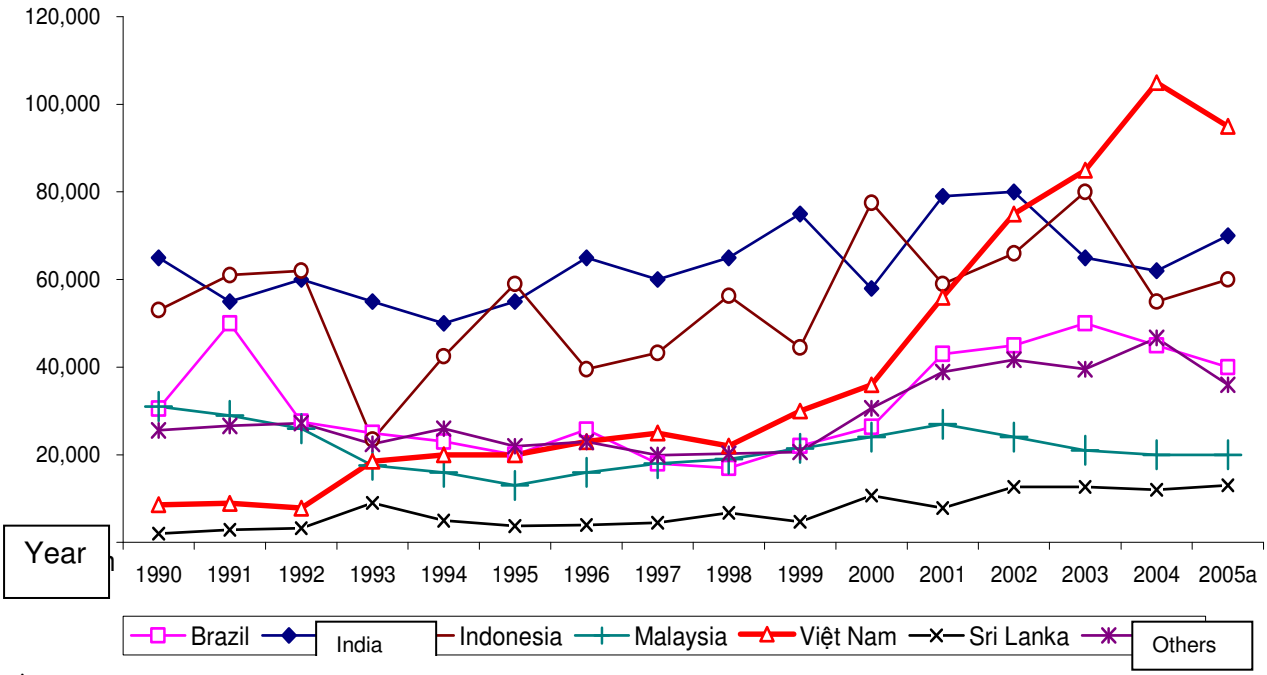
Source cited from: Vietnam Pepper Association, 2006
2007*: estimated data

Since 2004 the world total of pepper output for exporting has been estimated to decline because of widely insects in main pepper regions in the world and because of dramatically decreasing price in 2002. As the total of pepper output for exporting in the world market declined, the supply of pepper market was insufficient compared with the demand and the pepper price increased. In 2006 the pepper price suddenly increased and reached the highest level over the last five years from 2001 to 2006, sometimes over 3,000 USD/ton for black pepper and 4,000USD for white pepper. Sometimes, the price of black pepper in Vietnam reached 60,000VND/kg.

Table 1: Area and output of main pepper producing countries

Country	2004		2005		2006	
	Area (ha)	Output (ton)	Area (ha)	Output (ton)	Area (ha)	Output (ton)
India	231,880	62,000	-	70,000	-	50,000
Brazil	45,000	45,000	40,000	44,500	35,000	42,000
Indonesia	-	31,000	87,545	35,000	-	20,000
Malaysia	13,000	20,000	12,700	19,000	12,800	19,000
Sri Lanka	32,436	12,820	24,739	14,000	24,874	13,000
Vietnam	50,000	100,000	50,000	95,000	50,105	105,000

(Cited from: Vietnam Pepper Association, 2006)



* cited from: Vietnam Pepper Association, 2005

In the period 1993 - 2002, Vietnam pepper output was ranked after India and Indonesia. However, since 2003 Vietnam has become a leading country of the pepper output in the world. The pepper cultivation area in Vietnam reaches over 50,000ha with the highest pepper productivity compared with other countries in the world.

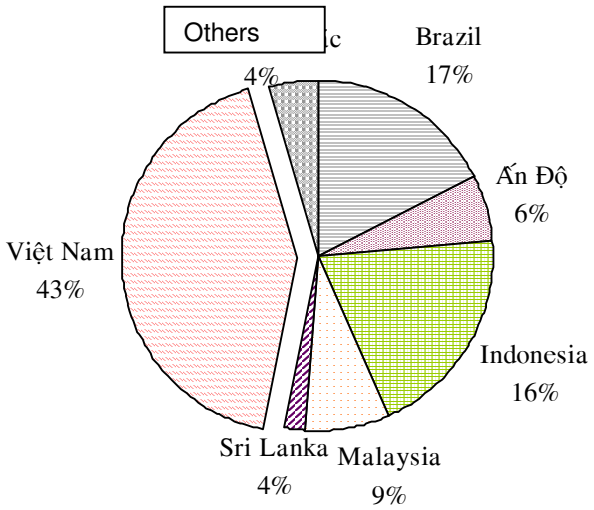


Figure 1: Export market share of black pepper in main export countries in 2004

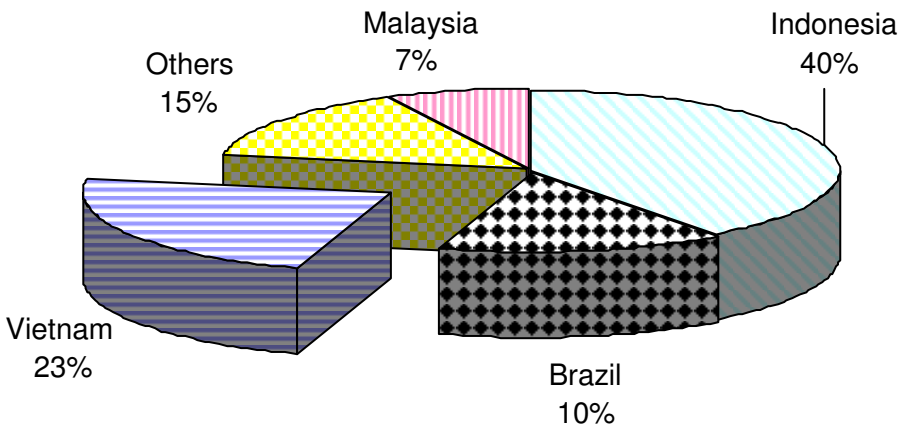


Figure 2: Export market share of white pepper in main export countries in 2004

Peppercorn is exported in the two forms: black pepper and white pepper (occupying 85% of the exporting output) and in the other forms such as green pepper and pepper oil. India, Malaysia and Madagascar are the countries which have exported a lot of green pepper. In 2004, India exported 1,540 tons of green pepper, Malaysia 150 tones and Madagascar about 600-700 tones. India is also a country which produces and exports a lot of pepper oil and oleoresin. Experts estimated that in 2004 India exported about 64 tones pepper oil and 1,200 tones oleoresin, Sri Lanka 1.5-2 tones.

The world annual output of pepper for importing is about 120,000-130,000 tones of peppercorn, 2,000 tones of green pepper and 400 tones of pepper oil and oleoresin. There are over 40 pepper importing countries, in which the United States, Germany and France are the leading countries. In 2004, European countries had the highest import market share, occupying 34%, followings are Asian and Oceanian countries. Recently, there has been a strong increase in the peppercorn consumption in Middle East and Northern African countries. The Middle East market attracts more and more the pepper output for importing.

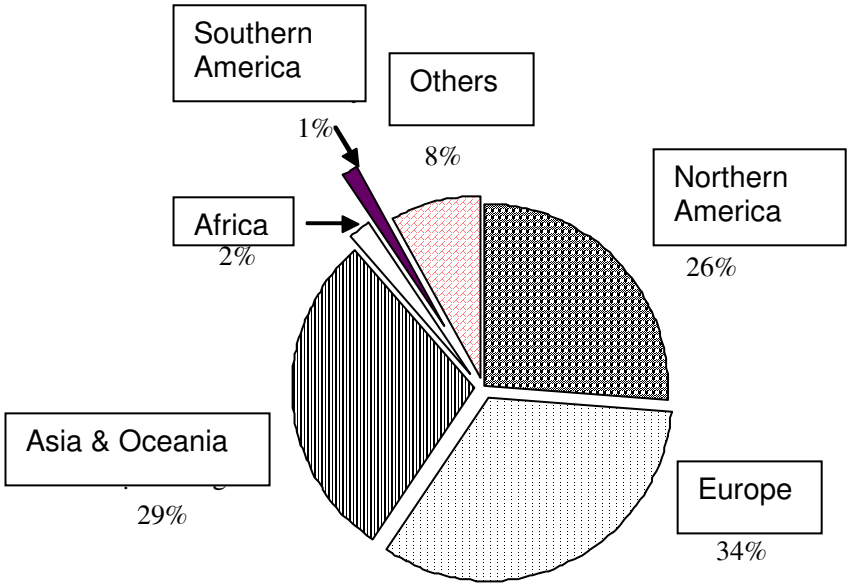


Figure 3: Market share of pepper importing markets in 2004

In conclusion: Peppercorn is one of spices types which has high commercial and exporting values. The demand of peppercorn annually increases from 4 to 5%. Although the pepper area and output has the increasing trend, this increase is not identical and depends much on the price changes and insects. It is forecasted that in the coming time, the supply market is insufficient compared with the demand and pepper will still bring high economic values compared with the other agricultural products.

Pepper production in Vietnam

Since 1975, the pepper output and productivity has had rapid leaps. In 1975, Vietnam has 500ha pepper area with the output of 460 tones, nearly unknown in the pepper exporting market. In 1996, we produced 7,000 tons of pepper. In 2001, we produced and exported 60,000 tons and ranked at the second after India (India produced around 80,000 tons in that year). Since 2003, Vietnam has left India behind and become a leading country of pepper production and export.

Table 2: Pepper area and productivity in some main regions

Region	Total area (ha)	Harvested area (ha)	Productivity (Ton black pepper/ha)
Total	47,776	38,610	2.22
1. Northern central	3,195	2,695	1.17
Nghe An	280	280	0.70
Quang Binh	315	285	0.80
Quang Tri	2,400	2,000	1.32
Others	200	130	0.70
2. Central coastal region	3,460	2,550	1.32
Quang Nam	110	80	1.60
Quang Ngai	200	150	1.00
Binh Đinh	250	160	0.70
Phu Yen	300	250	1.30
Binh Thuan	2,500	1,850	1.40
Others	100	60	1.00
3. High land*	13,221	12,300	2.33
Đăk Lăk	3,567	7,500	2.00
Đăk Nong	5,575	675	2.0
Gia Lai	3,575	3,800	2.80
Lam Đong	404	265	1.50
Kon Tum	100	60	1.00
4. Southern East	26,900	20,075	2.45
Binh Phuoc	13,500	10,500	2.50
Ba Ria-Vung Tau	7,500	5,200	2.60
Đong Nai	4,200	3,200	2.20
Binh Duong	1,400	950	2.00
Others	300	225	2.0
5. Mekong delta	1,000	900	2.91
Kien Giang	950	850	3.00
Others	50	40	0.90

Cited from: Vietnam Pepper Association, 2005
(Referring to the report of Agricultural extension in production regions)

1.2.1. Pepper area, productivity and output in some pepper regions in Vietnam

In Vietnam, pepper is cultivated in some main regions including Northern Central part, central coastal part, Highland, Southern East and Mekong delta, in which Highland and Southern East

are the two main pepper growing regions. Pepper is produced in some famous regions such as Tan Lam (Quang Tri province), Loc Ninh (Binh Phuoc province), Ba Ria (Ba Ria- Vung Tau province), Phu Quoc (Kien Giang province), Dak R'Lap (Dak Nong province), Chu Se (Gia Lai province). This will create favorable conditions for the planning of the centralized production regions with high exporting standards.

1.2.2. Pepper consumption and export in Vietnam

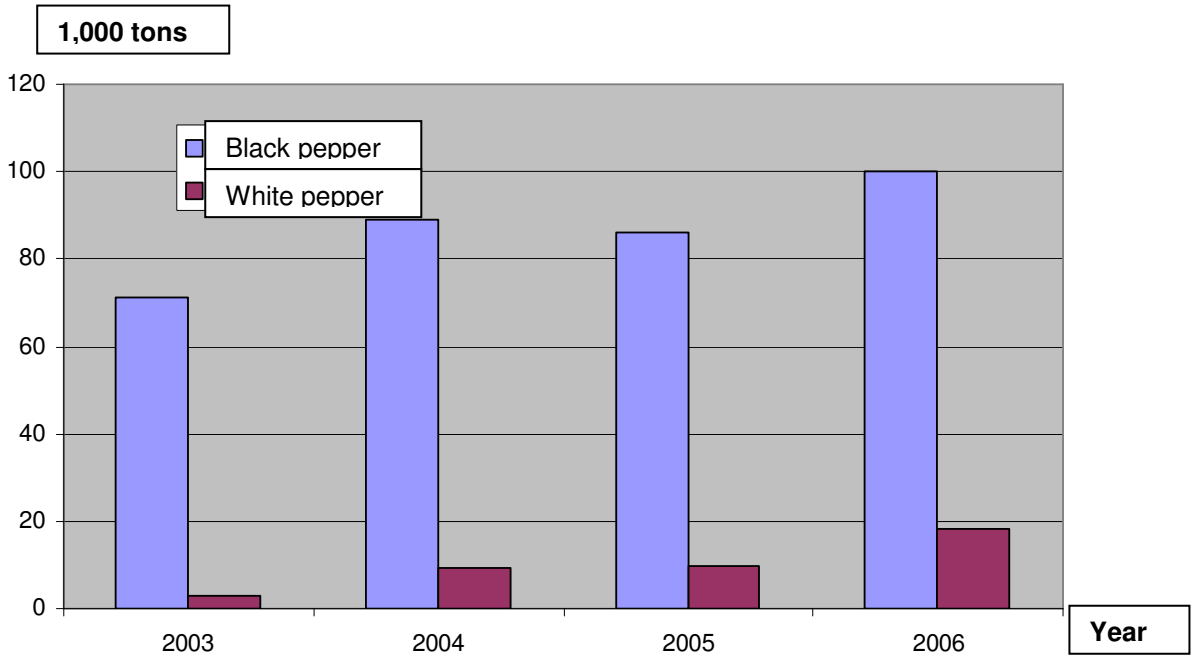


Diagram 3: Quantity of black pepper and white pepper for exporting

Pepper is not only consumed in the country but also mainly exported. Most of exported pepper is black pepper; the other products such as green pepper, pepper oil and oleoresin, etc hardly exported. Since 2003, Vietnam has begun to export white pepper. However, the output of white pepper for exporting occupies an unremarkable rate. The amount of white pepper annually increases; its quality is improved more and more meeting the customers' needs in the world market. In 2006, the quantity of pepper for exporting occupies nearly 20% of the total pepper exported. The increase of the exported white pepper contributes to the increase of the pepper exporting value in our country.
The export turn-over of pepper increases rapidly in the recent years.

- In 2001: 90,460 USD
- In 2002: 109,310,000 USD
- In 2003: 105,213,040 USD
- In 2004: 133,726,000USD
- In 2005: 150,123,824USD
- In 2006: 190,441,159 USD

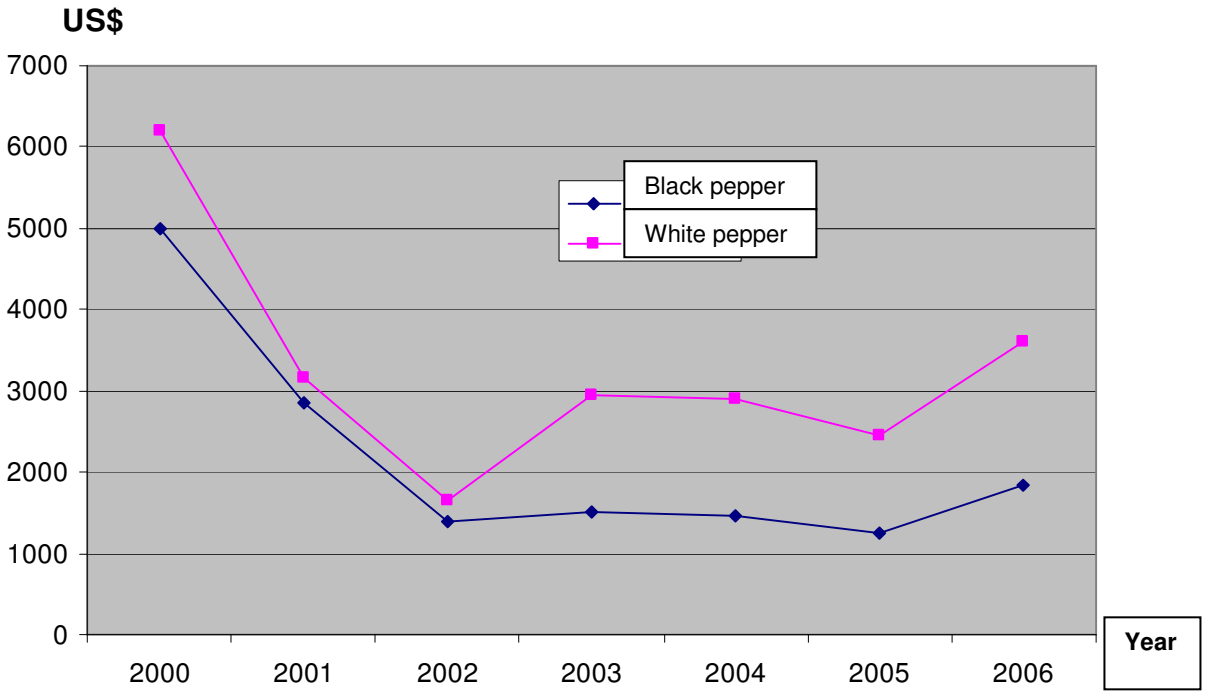


Diagram 4: FOB average price of Vietnam exported black and white pepper

The export market of Vietnam pepper has been continuously widened. In 2002, Vietnam pepper was only exported to 30 countries. Since 2005, Vietnam pepper has been exported to 80 countries in the world. Some other European markets require high quality such as Germany, France, Holland, etc accounting for over 40% of the market share in 2006. This shows that Vietnam pepper is improved in both quantity and quality.

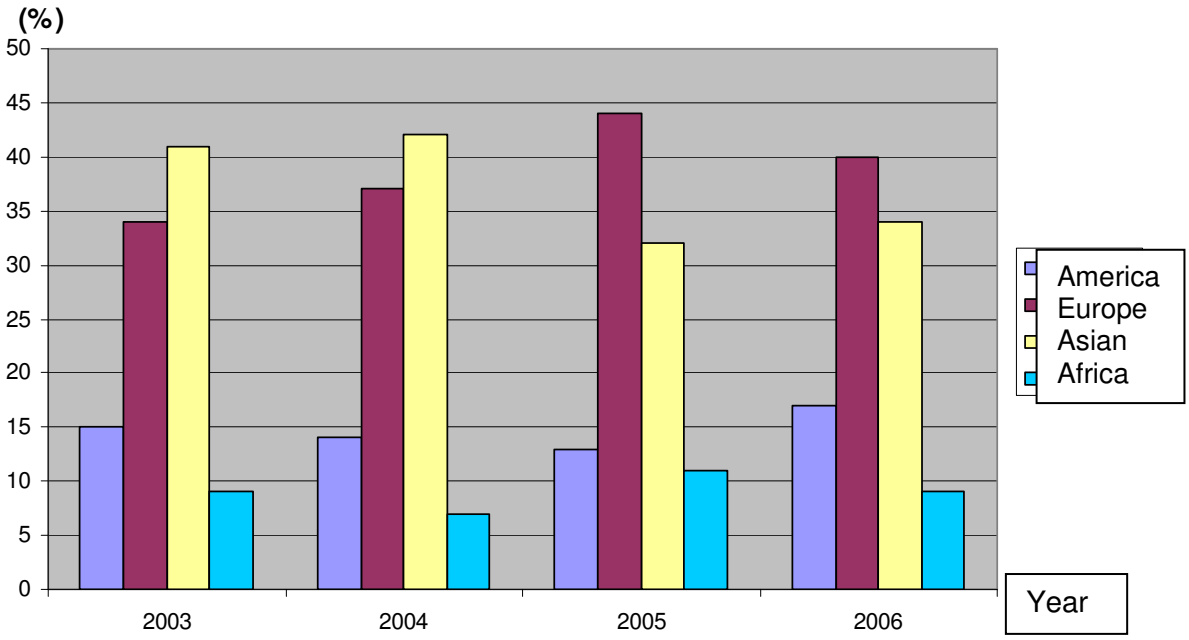


Diagram 5: Export market share of Vietnam pepper

2. STATUS OF PEPPER PROCESSING IN VIETNAM

2.1 Types of pepper products in international markets

Popular types of pepper products available in world markets are black pepper and white pepper. Nowadays, many valuable products have been developed from pepper. One product can be produced not using good quality pepper, such as pepper oil is produced using flat pepper – one kind of low-quality pepper. Many countries in the world have built a lot of factories for producing value-added pepper products. India is a country having an important position in producing and exporting value-added pepper products.

- Black pepper: the whole peppercorn including fruit and seed is dried to 13% of the humidity level. The finished product of black pepper is black and has a wrinkled fruit around the seed.
- White pepper: fully-ripe pepper is dried with the fruit removed. The finished product of white pepper is a round ivory white peppercorn.
- Pepper oil: is evaporable attar, which is extracted from pepper by using the method of steam distillation. This is a natural liquid mixture, transparent with the color of yellow green or a little bit green.
- Pepper oleoresin: is a concentrated extracted substance that is extracted using traditional solvent or in high temperature. Oleoresin is a mixture of attar, resin and other mixtures such as piperine alkaloid. Oleoresin has all the specific characteristics of being aromatic and peppery as natural pepper.
- Ground pepper: Dried peppercorns are ground into different sizes based on the demands of consumers. Currently, the technology of grinding pepper in low temperature has been introduced to avoid losing aromatic substances being evaporated during the process of grinding pepper. This technology also helps to eliminate bacteria and mould.
- Pickled green pepper: is green unripe pepper preserved in brine. After being harvested, carefully stripe peppercorns from pepper spikes and avoid breaking peppercorns. These green peppers are preserved in brine or vinegar to retain the natural green color and the characteristics of being soft and breakable of the green peppercorn. The finished product of green peppercorn is aromatic and spicy and is widely accepted by consumers.
- Dehydrated green pepper: this is a product processed from green pepper by processing the peppercorns at high temperature to neutralize the work of browning enzymes. The processed green peppercorns are then desiccated or dried out at controlled temperature so as to retain the natural green color after being harvested. After being soaked into water, peppercorns will recover their shapes and colors nearly like peppercorns themselves after being harvested. The harvest season for green pepper is available for just a short period of time in the year, whereas the demand for green pepper occurs all year round. Dehydrated green peppercorns can be preserved for one year then can meet demands for pepper consumption.
- Innovated green pepper: in order to overcome the disadvantages regarding to substances and flavor of dehydrated green pepper and the disadvantage regarding to packing costs of pickled green pepper, innovations have been introduced while processing green pepper. To produce the innovated green pepper, the green peppercorns are washed with water, next are soaked in brine for 2-3 months, then washed again with water and finally packed in PE bags for selling out at markets.
- Dry frozen green pepper: this is a high-class green pepper product that is produced by drying green pepper to the humidity of 4% at the temperature of minus 30-40^{0}C in the vacuum condition. Color, flavor and body of dry frozen green pepper are much better than green pepper dried under the sun light or dehydrated in the drying process. This product can be kept at the in-room temperature. After recovering its moisture, dry frozen green pepper looks like green pepper that just have been harvested. The processing process of this product requires complicated machinery then its price is very expensive.

- Red pepper: when peppers are fully ripe, their color turns from green to red. The red color is more attractive than the black color of black pepper or the ivory-white color of white pepper. To process red pepper, harvest pepper when almost the pepper berries on the spikes have fully ripened in red. The red pepper berries will be carefully striped off from the spikes. The other pepper berries will be covered for 2-3 days until their color turns into red. The red pepper berries after being stripped off from the spikes have to be processed during the day. People retain the red color of the pepper berries by soaking the berries into brine or vinegar together with food preservatives. After that, pepper can be dehydrated like in the process of dehydrating green pepper.

Besides, there are other products from pepper like pepper tea, pepper candy, aromatic pepper oil or flavoring used for cosmetic.

Nowadays, black pepper is still the most popular product for trading in the world pepper market. According to data from Pepper Association, in 2004 black pepper covers for 271,000 tons over the total volume of 351,000 tons of pepper being traded at international and national markets.

2.2 Processing and maintaining black pepper at household level

To process black pepper, the whole spike of pepper berries is harvested when there are some ripe or yellow pepper berries. Berries can be stripped off from the spikes by machine at once or all of the pepper spikes are piled up for 2-3 days before having berries striped off, which depends on the amount of pepper being harvested. To be easier in striping off pepper berries, people put berries in close bags or make a pile of spikes and cover it with canvas for 12-24 hours, then have berries striped off. Peppercorns are dried on cement yard with canvas to keep peppercorns clean and avoid sand or stones. A 2m high fence is set up around the yard to prevent animals entering the yard and leaving some impurities. Dirty sandals or shoes are not allowed inside the pepper drying yard.

Pepper is dried with the layer of 2-3cm thick, regularly reserved for 4-5 times/day within 3-4 sunny days. The product is maintained only when the dried peppercorns are steadily wrinkled, black and reach the humidity of 12 - 13%.

Use fan to blow away impurities, flat peppercorns then pack the finished product into bags for maintaining before selling out. Only pack the product after peppercorns are cool down. Pack pepper with the inner layer of nylon and outer layer of jute bag. The layer of nylon prevents pepper from absorbing moisture and getting mould that can affect the quality of black pepper. Each bag of pepper is 50kg, and maintained in clean, airy storehouse.

Summary of the processing process of black pepper at household level

Pepper → Strip → Dry → Black pepper → Reject impurities → Pack → Maintain

2.3 Processing and maintaining white pepper at household level

2.3.1. Process white pepper by hand from ripe pepper

The method of processing manually white pepper is that harvest spikes of fully ripe pepper with more than 50% of red and ripe berries, cover for 2-3 days, strip off berries, soak berries in running water or in soaking tanks with water changed daily. Soak pepper berries from 7 - 10 days until the pepper husk is soften, trample pepper husk using bamboo basket or machine then pan the removed husks and dry the corns for 1-2 suns on the broad flat drying basket until the corns have the humidity of 12 - 13% and this is when the finished product can be

maintained and sold out. Manual processing is used for a small amount of pepper because farmers have to select each spike of pepper, but the finished product has high quality and is loved by costumers.

2.3.2. Process white pepper by semi-industry from black pepper

Survey from current areas of producing pepper shows that some households process white pepper from their own black pepper, while some other households also gather black pepper from other households. The method for processing white pepper is rather simple, which is as follows:

Select black pepper with natural weight>550g/lit to process into white pepper. Use fan to carefully blow away flat pepper. Heavy peppercorns are put into bags and soak into cement tanks for 7-8 days. Change water every 2-3 days or leave water unchanged until pepper husks are decomposed. Grind pepper to remove husks out of the peppercorns and then pan the peppercorns. The peppercorns after being panned to release their husks have a color of ivory-yellow. Based on the market demand, people can whiten peppercorns by soaking them into H_20_2 concentration 2% for within 30 minutes to oxidize organic and color substances. After whitening peppercorns, dry peppercorns on yard with canvas, or desiccate peppercorns at the temperature of 50-60 ^{0}C in continuous hours to reach the humidity of 12%.

With this method of processing, the quality of white pepper is not high and equal. Other problem is that environmental pollution often occurs and the stinking smell from soaking tanks is very strong. The reason is that the households do not pay much attention to the issue of draining dirty water.

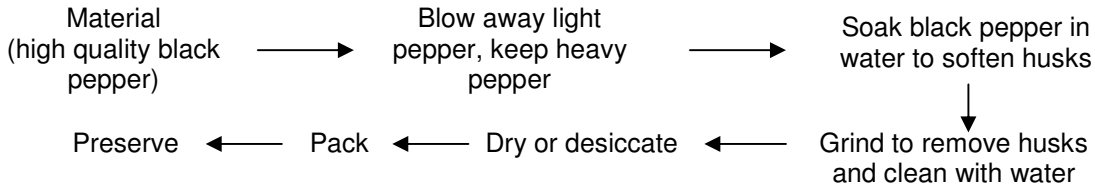
Based on the survey in pepper zones of Gia Lai, Dong Nai and Ba Ria-Vung Tau, value of 01 ton of good level black pepper after being processed into white pepper increase VND 5-6 million. Investment cost for infrastructure for processing white pepper including soaking tank and husk grinding machine is not high, just around VND 12-15 million. If a source of material is available, every day an amount of 800-1000kg of white pepper can be processed from black pepper. Processing black pepper into white pepper can help farmers increase their incomes, but because the issue of environmental pollution is not paid much attention then in the processing areas, pollution always happens because of the stinking smell and the polluted water after being used for washing white pepper.

Quite similar as maintaining black pepper, white pepper after being dried or desiccated up to the humidity of 12-13% will be preserved before selling out. Pepper is packed with inner layer of nylon and outer layer of jute bag. The layer of nylon prevents pepper from absorbing moisture and getting mould that can affect the quality of white pepper. Each bag of pepper is 50kg, and maintained in clean, airy storehouse. Preserving time of white pepper at households is not long because they process white pepper based on the production orders from buyers for export.

H3: Soaking tank of black pepper

Husk grinding machine after pepper being soaked

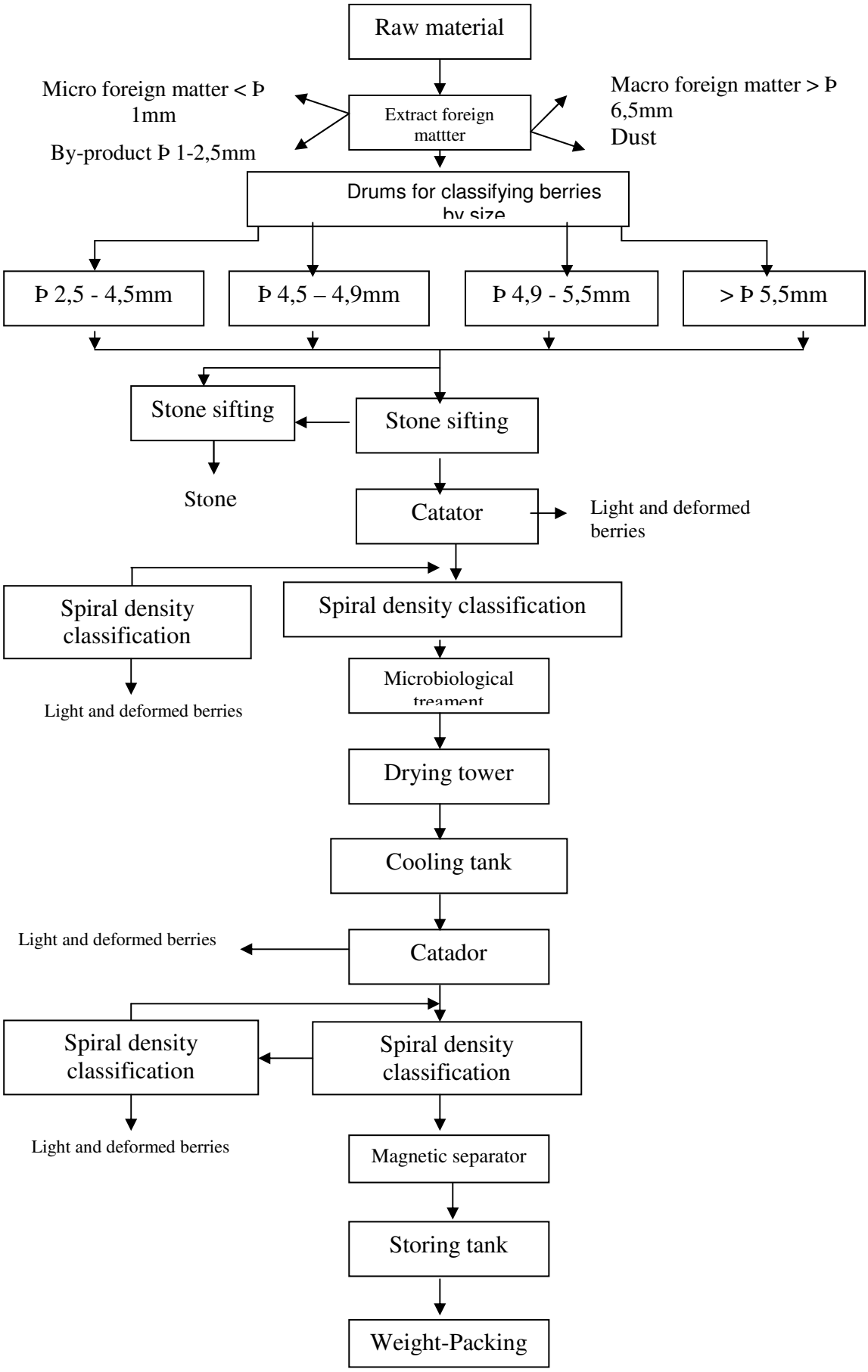
Summary of the processing process of white pepper



2.4.1. Black pepper

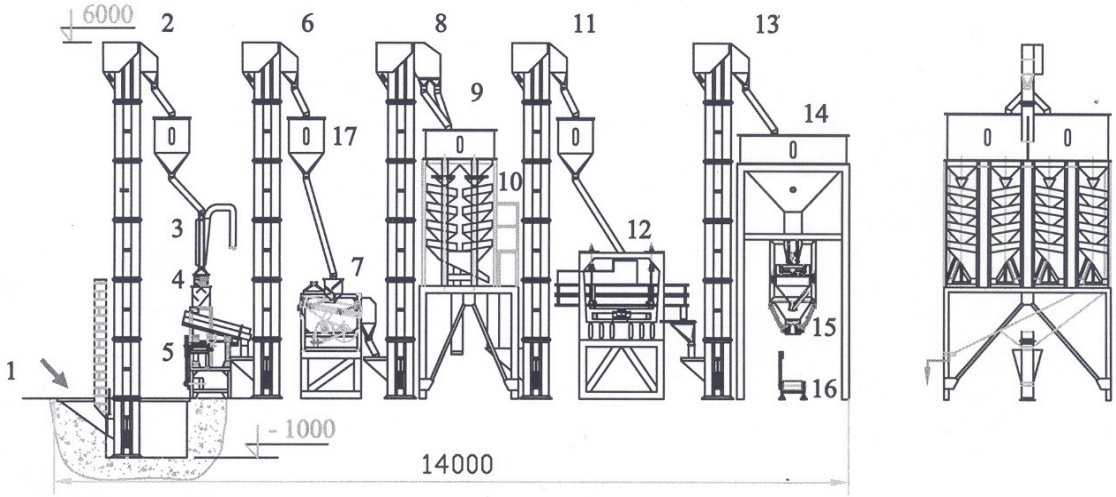
Black pepper is purchased for processing into Black Pepper for Export. The objective of the processing technology is to produce better Mục tiêu của công nghệ chế biến là hoàn thiện sản phẩm, nâng cao giá trị chất lượng sản phẩm, an toàn về chất lượng khi kéo dài thời gian tồn trử và sử dụng.

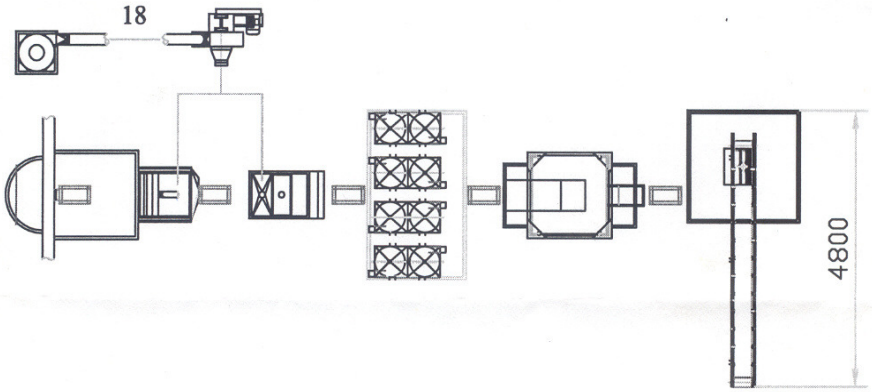
CHART: BLACK PEPPER PROCESSING TECHNOLOGY



PROCESSING LINE FOR BLACK PEPPER

Productivity: 1 – 1.5 tons/hour





TT	Tên thiết bị	Môtơ Kw	Kiểu	Số lượng
1	Hố nạp liệu			01
2	Bồ đài	1,5	BE-200-440-7m	01
3	Thùng rê Kice (Hút bụi)			01
4	Bộ tách từ vĩnh cửu			01
5	Sàng tạp chất	1,1	CS80N	01
6	Bồ đài	1,5	BE-200-440-6m	01
7	Sàng tách đá	15	DS20A	01
8	Bồ đài	1,5	BE-200-440-6m	01
9	Thùng chứa		1 Tấn	01
10	Bộ phân loại xoắn ốc	2ø500-2000	300kg	04
11	Bồ đài	1,5	BE-200-440-6m	01
12	Sàng đảo	1,1	FS20	01
13	Bồ đài	1,5	BE-200-440-6m	01
14	Thùng chứa		1,5 Tấn	01
15	Cân định lượng tự động		DSS60 SINCO	01
16	Băng tải	0,75 GT	SWBC 300-4000	01
17	Thùng chứa		200 kg	03
18	Quạt hút bụi + cyclone	4	F40	01

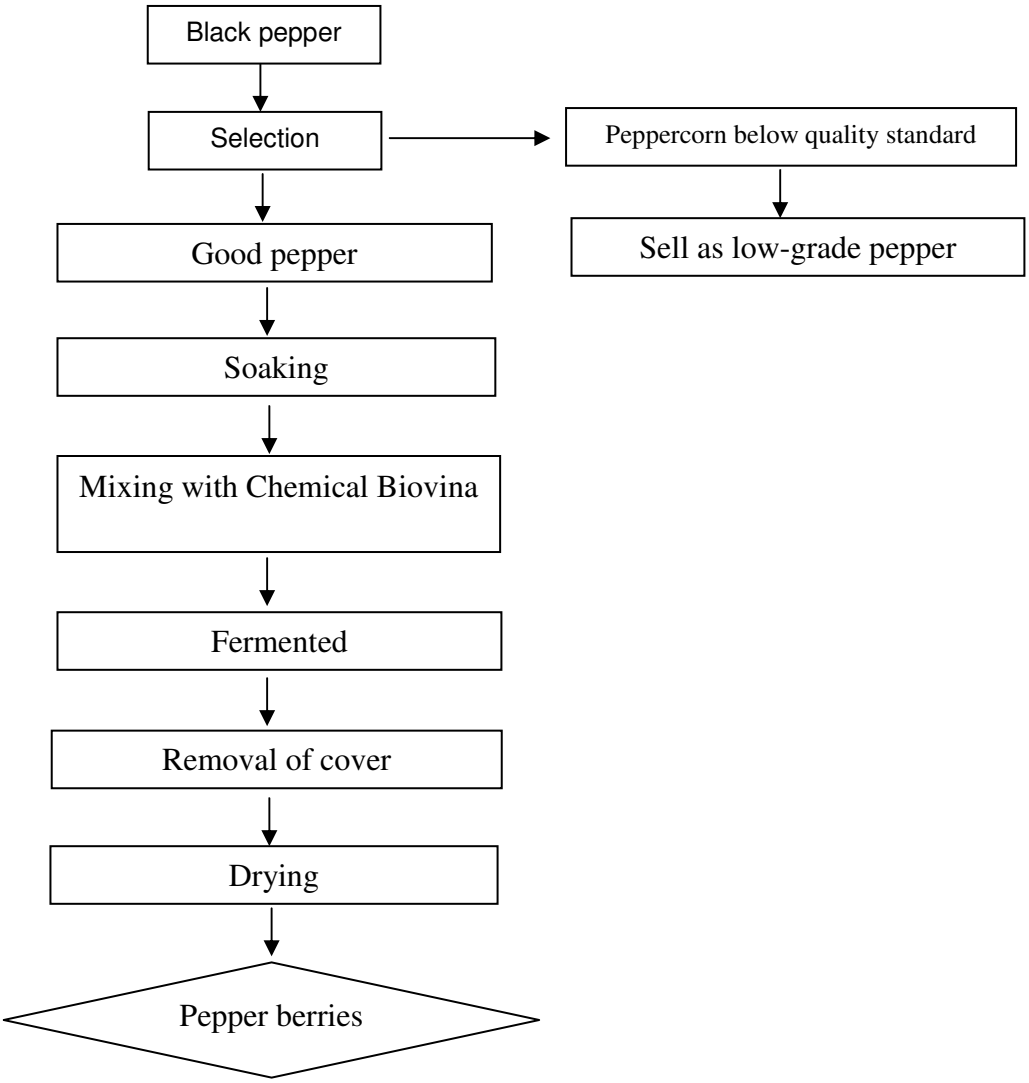
No.	Material	Motor Kw	Type	Quantity
1	Raw pepper pond			01
2	Scoop	1.5	BE-200-440-7m	01
3	Winnowing tank Kice (Dust extracting)			**01**
4	Permanent magnetic separator			**01**
5	Foreign matter sieve	1.1	CS80N	**01**
6	Scoop	1.5	BE-200-440-6m	01
7	Stone sieve	15	DS20A	01
8	Scoop	1.5	BE-200-440-6m	01
9	Storing tank		1 ton	01
10	Spiral density classifier	2Þ 500-2000	300kg	04
11	Scoop	1.5	BE-200-440-6m	01
12	Reverse sieve	1.1	FS20	01
13	Scoop	1.5	BE-200-440-6m	01
14	Storing tank		1.5 tons	01
15	Automatic weight		DSS60 SINCO	01
16	Conveyor belt	0.75GT	SWBC 300-4000	01
17	Storing tank		200kg	03
18	Fan for winnowing dust+cyclone	4	F40	01

2.4.2. White pepper

Quite similar to the semi-industrial processing of white pepper, the industrial processing also undergoes through all the procedures of soaking, food hygiene treatment, drying and sewage treatment, yet, with greater processing volume and at a higher level of industrialization.

In order to mitigate the sewage's pollution from industrial processing, many factories have not only chosen high quality black pepper for processing into white pepper but also procured pepper kernel, which is a product of farmers' semi-processing, then to further process with whitening, drying and packaging as per export standards.

CHART: WHITE PEPPER PROCESSING TECHNIQUES



In Vietnam, there are either foreign companies, foreign joint ventures companies and private enterprises like as Harris Preman, Vina Hariss, Man-Spice Vietnam, Truong Loc Enterprise, Maseco, Tan Hung Enterprise, Agrexport HCM, Intimex HCM which have invested in modern techniques machinery for steaming and drying pepper by steam as well as microbiological treatment. Pepper product has reached high standard in terms of food hygiene safety.

Several enterprises like Thach Loc, Intimex Binh Duong, Olam, ect., have started to produce pepper powder packed in sterile jars, which are currently sold on domestic market and will be exported with a view to adding more value to pepper product.

In general, pepper processing techniques in Vietnam are continuously improved and could meet all customers' demands for pepper products.

3. EXPORTED PEPPER STANDARD

3.1. Vietnam pepper standard

Before 2003, there was standard code TCVN5837-1994 for Vietnam pepper. In 2002, General Department for Quality measurement and standard collaborated with members of Pepper association to establish the Standard set for Vietnam pepper, including:

TCVN 7036-2002 Black pepper
TCVN 7037-2002 White pepper

This standard set is stricter than the standard set TCVN 5837-1994 in terms of setting the quality requirements of either partially-processed pepper (NP) and processed pepper (P).

Table 2: Physical and chemical criteria of black pepper

Indicator	NP	P
Moisture content (% by weight)	≤13	≤12,5
Bulk density (g/liter)	450-600	600,0
Extraneous matter (% by weight)	0,2-1	≤ 0,2
Light berries/corn (% by weight)	2-18	≤2
Broken or flat berries (% by weight)	2-4	1
Ash content (% dry basis)	≤7	≤6
Ether extract (% dry basis)	6	6
Oil content (ml/100g dry basis)	≥2,0	≥2,0
Piperine content (% dry basis)	≥4,0	≥4,0

Table 3: Microbiological and sanitary indicators of black pepper

Indicator	NP	P
Total of aerobic Plate Count (cfu/g, maximum)	-	-
Coliform (cfu/g, maximum)	-	102
Ecoli (MPN/g, maximum)	-	0
Salmonella (detection/25g)	-	Nil
Mould & Yeast (cfu/g, maximum)	-	-
S. aureus (cfu/g, maximum)	-	102
Insect (whole)	Nil	Nil
Mammalian excreta (mg/lb)	-	-
Other excreta (mg/lb)	-	-
Disease berries, insects (% weight)	-	-
Mold (% weight)	Nil	Nil

NP : Semi-Processed P : Processed

In fact, this standard is not yet applied popularly for Vietnamese pepper export.

3.2 Current standards for exported pepper

Vietnam pepper is mainly exported in form of raw material, thus only subjecting to some basic criteria in terms of moisture content and extraneous matter as mutually agreed in the supply contract and letter credit.

- Standard FAQ (Fair Acceptable Quality):
This standard is often subject to export of the following types :

+Black pepper FAQ 550g/liter: Bulk density: 550g/liter; Moisture:12,5%; Extraneous matter:0,5%; Free from any insect or mould.

+ Black pepper FAQ 500g/liter: Bulk density: 500g/liter; Moisture:13%; Extraneous matter:1%; Free from any insect or mould.

- Standard ASTA (American Standards Trade Association)

+ Bulk density: 570g/liter for black pepper and 630g/liter for white pepper
+ Moisture: ≤ 12,5% + Mammalian excreta: ≤ 1mg/lb (454g)
+ Extraneous matter: ≤ 1% + Other excreta: ≤ 5mg/lb
+ Light berries: ≤ 2% + Insects: ≤ 2 con/lb
+ Mouldy berries: ≤ 1% + Salmonella: Nil
+ Berry size on ф 5mm plate: 100% + Pepper is cleaned by hot water steam

Besides, some European and Middle East countries require very high sanitary and safety criteria such as be free from heavy metal like Arsen, Cadmium, E-coli and radioactive substance, ect.
More than 95% of Vietnam pepper is exported under FAQ standard, with bold density ranges from 500-550g/liter, moisture from 13 -13,5% and extraneous matter from 0,5 -1%. The pepper amount exported under ASTA standard is not significant.

3.3 Pepper standard of IPC (International Pepper Community)

IPC has specified two grades: each for whole black pepper and whole white pepper as followed (see attached index).

4. PEPPER TRADING CHANNEL

Like other main pepper producing countries, Vietnam export most of its pepper product, domestic consumption of pepper is insignificant. Annual export volume makes up 95% of total pepper output.

4.1 Domestic pepper trading channel

Common character of major pepper areas nationwide is that almost pepper growers sell pepper within 2 to 3 months after the harvest. Main reasons for not storing pepper for long time after harvesting are cash need for family expenses, debt payment for recent investment into last pepper crop as well as capital for new crop investment. The fact that farmers do not have proper storing facility and are afraid of the risk caused by price fluctuation does contribute to the quick sales of all pepper produce. Farmer households which stock up pepper over 3 months are often rich, middle-income households or having incomes from other agricultural and non-agricultural activities.

There are four key actors in the pepper trading channel running from post-harvesting stage till off-shore shipment: pepper producers, collectors (private traders), wholesaler agents, and export enterprises.

Pepper growers do not often sell pepper directly to wholesaler agents or export enterprises but mainly to collectors (private traders). There is only small amount of pepper is sold directly to markets.

Thanks to good information system, there is no price-sinking phenomenon. Pepper price is decided and agreed by buyer and seller, depending on timely market price, bulk density and moisture content of peppercorn. In some areas such as Xuan Loc district of Dong Nai province, Chau Duc district of Ba Ria-Vung Tau province and most recently Chu Se district of Gia Lai province, black pepper has been processed to make pepper kernel for selling to collectors and local markets.

According to study by Dr. Nguyen Tang Ton, at the pepper area in Ba Ria-Vung Tau, there are more and more pepper growers who want to sell their produce to wholesaler agents directly; pepper selling can take place at wholesaler's place or at farm gate. However, the volume of direct sale to wholesaler agents is limited (22%), compared with sale to private traders (make up 78%) at the farm gate. Private traders have more advantage over wholesaler agents because they can reach out to distant large areas to collect varying volumes of pepper ranging from ten kilograms to some hundreds or even one ton. In fact, prices gap between collectors' intake and that of wholesales is not big, often around 80-100VND/kg; still, pepper growers trust

wholesalers in determining quality and weight of product with more accurate measuring scales of the wholesalers.

Private traders often sell their collected pepper to wholesaler agents within the same day or several day after collection; few traders store more than 3 tons pepper at home. Whenever wholesaler agents need a great intake of pepper, they can give cash advance to private traders. A small amount of pepper can be re-dried with sunlight and further cleaned by traders before selling to retailers in local markets and other adjacent areas. There can also happen the situation when traders mix high quality pepper being graded by growers with bad pepper being bought at lower price before selling to agents for higher profit.
Wholesaler agents normally have storing facility that can stock up to 10-15 tons pepper depending on the pepper plantation area. These agents have transport means or regular transport contracts to transport pepper to processing factory or pepper trading-exporting enterprises. Pepper collected from traders or producers is handled in two ways, either being sold right away to processing factory/enterprise on a profit of around 100-120 VND/kg, or primarily processed with further sun drying till pepper get evenly dried and moisture content below 14%, and cleaning off extraneous matters. When selling primarily-processed pepper, wholesaler agents gain 120-150VND/kg net profit.

Although wholesalers have substantial financial source and storing facilities, few of them store more than 30 tons pepper at a certain time, being afraid of pepper market price falling and liability for bank interest. On average, in one pepper crop, each wholesaler conduct the trading of total 200-300tonnes, even 500 tons or more with the pepper collected from nearly districts.

Several wholesalers with substantial capital and good warehouse condition do not only conduct black pepper trading but also organize the processing of black pepper into pepper kernel/white pepper and volume of pepper kernel/white pepper is varying from time to time depending on the orders from processing and export enterprises. Wholesalers get 150-250VND/kg net profit from processed pepper kernel/white pepper.

In some pepper areas of Binh Duong, Dak Nong and Dak Lak provinces, wholesalers run quite small business and few of them do business of processed white pepper. In Gia Lai province, Maseco Company has set up one pepper processing factory based at the Chu Se pepper plantation area, thus having strong geographical advantages on commercial circulation of pepper product as well as processing pepper for export.

4.2 World pepper trading channel

Depending on the world supply/demand for pepper and timely market prices, most of key pepper producing, exporting and importing countries participate in both export and import of pepper. Typically, Vietnam has been the leading pepper export country since 2002, in 2003, she imported nearly 2,000 tons pepper of different kinds from different sources for processing and supply to ordered clients. (VPA, 2004).

There are 6 key pepper producing and exporting countries being members of the International Pepper Committee (IPC), they are India, Brazil, Indonesia, Malaysia, Sri Lanka và Vietnam. In recent years, Cambodia has entered the pepper world market (IPC, 2005), mainly channeling through informal export in form of raw material to pepper trading enterprises of Vietnam, at which raw pepper is processed for re-exporting to the world market.

In total, there are more than 120 countries importing pepper, in the same time, exporting countries keep on diversifying their exporting markets to other countries. Major markets of black pepper, pepper oil and oleoresin is North America, Tổng cộng có hơn 120 nước trên thế giới nhập khẩu hồ tiêu, meanwhile main market of white pepper is Europe. In 2004, these two markets only imported 60% traded volume of pepper worldwide, of which 30% is re-exported to other countries (IPC, 2005).

There are about some 30 key leading wholesalers competing in the pepper market of each pepper producing and exporting countries. In Indonesia, for example, about 30-40 pepper trading enterprises based in Jakarta, Lampung and Pangkal Pinang (Balembang) do trading of 5,000-7,000 tons pepper every month. In Malaysia, pepper trading channel consists of 3 levels like in Vietnam. Small collectors go to individual farmer households to buy pepper, then sell to agri-products wholesalers, which supply a total of 2000-2500 tons pepper to around 30 pepper processing and exporting factories each month. (IPC, 2004).

On the side of import market, linkages amongst key importers are quite good since pepper trading companies in these importing countries are very pro-active. Importers that have influence on the world pepper market mostly base at some big international port like New York and New Jersey in North American market and Hamburg and Rotterdam in European market.

There are 3 countries not producing pepper but actively participating in the world pepper trading channel, they are Singapore, Germany and Netherlands. These countries import black and white pepper from pepper producing countries like Indonesia, Malaysia and Vietnam then export to other countries such as United Arab countries, Egypt, Germany, Netherlands, United States, ect.

5. EVALUATION OF PEPPER SUB-SECTOR DEVELOPMENT IN VIETNAM

Strengths

- Favorable natural condition, notably fertile land and suitable weather condition for pepper plantation.
- Intensive pepper plantation areas have been formed up, making the trading of pepper easier.
- The smallholder economics model is appropriate for pepper production, thus achieving high cost-effectiveness and being able to make use of abundant laborers.
- Many farmers have made high investment for intensive pepper plantation; on the other hand, growers have valuable experience in high-technique cultivation of pepper so that on overall, the productivity is quite high.
- Economic situation of most pepper households is quite good and well-educated laborer resource enable the access to most advanced technical innovations.

Weaknesses:

- There is not yet a technical manual on sustainable and intensive plantation of pepper with an aim to sustaining the high cost-effectiveness to pepper producers, and at the same time, preserving the stability of ecological environment.
- Some cultivation techniques are improper such as making use of wood pole for pepper plants, the issue of shadowing plants for pepper is not properly considered. In order to exploit the most of pepper farming, high and unbalanced mixture of fertilizers are applied together with more-than-necessary watering have helped achieving high productivity; nevertheless, this results in the unstable growth of pepper garden and high vulnerability to typical diseases/infection as well as shorten the lifespan of pepper trees.
- Diseases and insects on pepper trees are overwhelming, with which there is not yet efficient prevention and treatment measures to cure.
- Poor product lines made from pepper.
- Pepper price greatly depends on the world market, combining with expensive investment as per plantation area and uncontrollable diseases/insects development add to the higher risk for pepper producer compared to other crops.

Opportunities

- Parallel to the national integration into global market, Vietnam pepper sub-sector has been join the membership of the International Pepper Committee, opening a great deal of

opportunities to make greater access of Vietnam pepper to more importing countries worldwide.
- The pepper world market has been booming sustainably in recent years.
- In 2007, the Chairman of Vietnam Pepper Association-Mr. Do Ha Nam is elected as the Chairman of the International Pepper Committee.
- The marketing and commercial campaign for Vietnam pepper brand is on a promising move toward the world market. There has been a success on the establishment of Chu Se-originate pepper brand of Gia Lai province

Threats
- Consumers' requirement for product quality as well as food hygiene and safety get high and higher.
- Besides, consumers are getting more concerned over the friendliness of the production process toward the environment and society.
- In many pepper plantation areas nationwide, there persists the unsustainable pepper production which high productivity is achieved but with shorter pepper lifespan and big threat from serious diseases and insects.

In order to sustain the competing advantage of our pepper, we should assure the pepper production are conducted in sustainable manner and new innovations on pepper techniques are applied by producers thus safeguarding their net income in the context of increasing inputs costs and volatile pepper price.

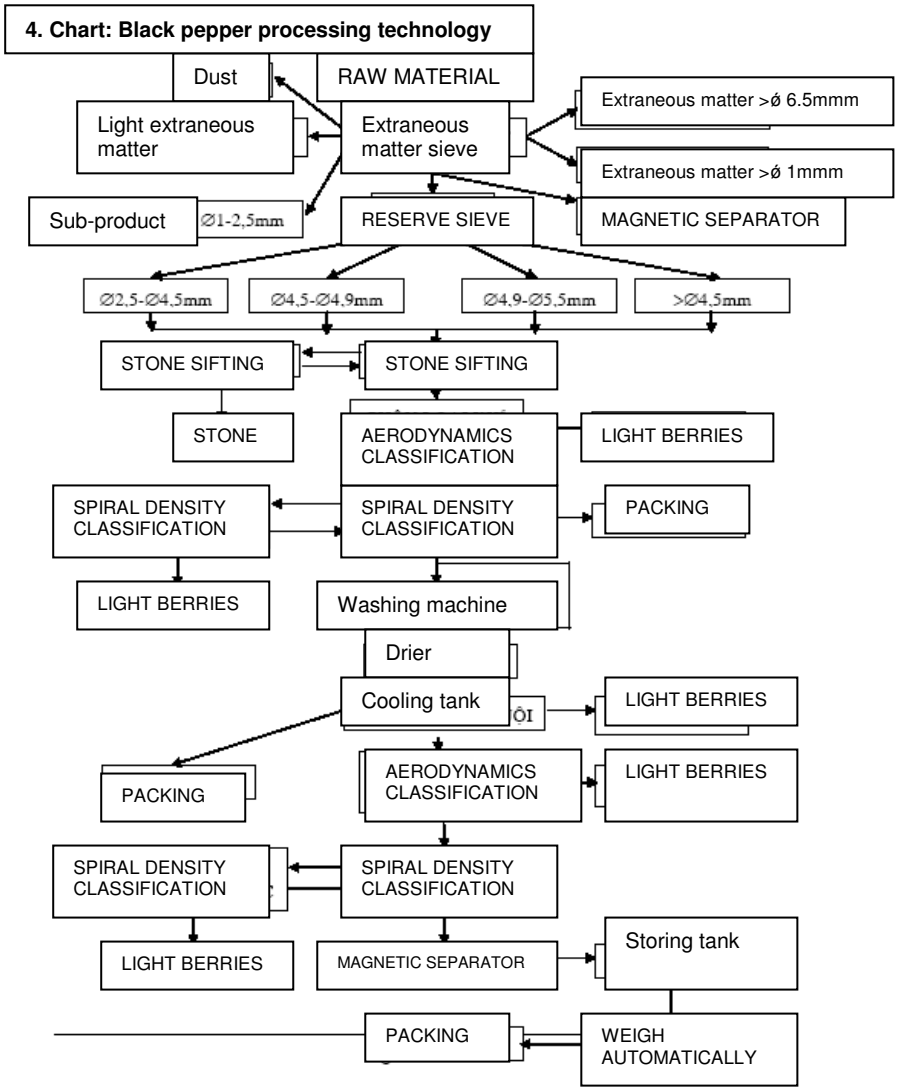
Annex 1 List of pepper exporting enterprises and exporting quantity of Vietnam in the period 2003 - 2006

No.	Name of enterprise (Unit: ton)	2003	2004	2005	2006
	VPA	***56,660***	***75,162***	***77,935***	***99,868***
1	Olam	2,532	6,418	9,586	10,105
2	Phuc Sinh Company	4,216	4,909	6,059	9,946
3	Pitco	4,054	4,095	5,613	9,247
4	Haprosimex HCM	3,795	5,042	3,964	8,394
5	Intimex HCM	8,678	9,765	8,026	8,153
6	Petec				7,525
7	Ngo Gia Company	1,025	2,549	5,910	6,812
8	Ned Spice	5,685	4,520	5,479	6,569
9	Hapro	2,196	3,692	4,831	6,208
10	Simexco Daklak	1,355	2,443	3,417	4,073
11	Intimex export and import	6,769	5,662	5,586	3,769
12	Kraal	1,505	3,985	3,330	3,128
13	Thanh Ha	3,729	6,195	4,212	2,961
14	Vinaharris	3,471	5,789	751	2,669
15	Thạnh Loc Company	948	1,833	480	2,640
16	Generalexim	282	616	753	2,471
17	Maseco		1,047	2,625	1,762
18	Vegetexco	1,281	1,579	1,279	1,516
19	Truong Loc Enterprise	209	870	871	686
20	Vilexim	1,026	1,494	1,401	675
21	Hau River Plantation	14			247
22	Agrexport Sai Gon	771	410	548	125
23	Vinh Hiep				110
24	Agrex Sai Gon	608	492	865	51
25	Tin Nghia Company	1,138	461	466	26
26	Others	1,373	1,296	1,883	
	Non - VPA	***17,375***	***23,332***	***18,244***	***16,802***
27	Harris Free Man	4,661	7,745	3,933	5,694
28	Petec	3,224	4,745	4,744	
29	Son Ha Spice		325	201	2,686
30	Nghe Tinh Food	27	762	1,255	1,611
31	Health No.2	660	1,405	1,529	1,293
32	Tran Chau Export and Import Company				747
33	Vietnam Spice				659
34	Ba Ria-Vung Tau Tourism	57	220	615	625
35	Prosimex				613
36	Ha Noi Investment Export and Import	365		124	564
37	Agricultural Products	1,081	1,571	897	542
38	Sai Gon Trade- Service		747	820	510
39	Phu My			240	377
40	Minh Huy	953	712	505	357
41	Quang Nam Food and Service joint-stock Company		68	183	262
42	Coffee Import and Export Business Center	646	2,197	1,066	262

43	An Phuc International Trading Co., Ltd	124	356	287	
44	Others	5,577	2,479	1,845	
	Total	74,035	98,494	96,179	116,670

Annex 2: Clean pepper processing technological line of Maseco company:

Presentation on clean pepper processing of the project “Export Agricultural Product Enterprise”



Stage 1: Clean

Raw pepper is put into a raw pepper pond built under the ground and then transferred to the foreign matter sieve by a conveyor. The foreign matter sieve operates based on the principles of kinetics, weight separating and volume separating. Consequently, the foreign matter sieve can separate about 90% of extraneous matter in peppercorns including: micro extraneous matter, macro extraneous matter and light extraneous matter (consisting of dust).

In addition, thanks to the magnetic part, the foreign matter sieve can separate iron and steel in the raw material.

After leaving from the foreign matter sieve, raw peppercorns are in size of from 2.5 mm to 6.5 mm.

Stage 2: Classify berries by size

After separating extraneous matter, peppercorns are transferred to a reserve sieve by a conveyor for classifying. The reserve sieve is classified into three forms with the size of 4.5mm, 4.9mm and ø 5.5mm. After being cleaned, peppercorns are classified into 4 types of products:

- Peppercorns in size of F2.5mm - F4.5mm
- Peppercorns in size of F4.5mm - F4.9mm
- Peppercorns in size of F4.9mm - F5.5mm
- Peppercorns in size of over F5.5mm

After being classified, peppercorns are put into 4 tanks. After that peppercorns will be mixed based on the product needs for exporting or continue to be processed.

Stage 3: Stone separating

Before being put into stone separator, peppercorns still have stones with the same size as peppercorns. The stone separator operates based on the distinguishing principle of the pepper density with the same size. Light peppercorns will be elevated by an air stream creating a stream parallel with the sieve to get outside. At the same time, heavy stones will drop and smash into the sieve edges and reservedly flow to get outside.

Stage 4: Classify by aerodynamics

After leaving from the stone sieve, there remains hard and spongy peppercorns due to the same size. Peppercorns will be put into the catador. This equipment contains an air stream blew in the bottom-up way in the vertical direction. Therefore, light spongy peppercorns will be elevated and get out while hard peppercorns will be hung and get out in the other way. The air stream in the catador can be adjusted depending on the pepper quality.

Stage 5: Spiral density classification

After the above stages, peppercorns are still different in the shape such as deformed peppercorns or round peppercorns or mixed with pepper stems.

The spiral classifier is created with spiral bulkheads spinning a vertical pivot. The mixture of deformed and round peppercorns will be put into the above mouth of the spiral classifier. Under the impact of the gravity, peppercorns drop in the spiral direction. As round peppercorns spin, their acceleration will gradually increase until they spin in the slope of the outer bulkhead and are separated. At the same time, deformed peppercorns drop freely from the spiral trough and have friction higher than the speed of the flow. Therefore, deformed peppercorns will flow nearer the spiral pivot and get out.

Step 6: Wash and process microorganisms by water steam

To eliminate harmful microorganisms, especially Salmonella bacterium, people use steam with pressure from 2 ÷3kg/cm^2 with the temperature from 1,200^{0}C – 1,400^{0}C to spray into peppercorns in the shortest period of time (about 20-40 seconds). During the process of absorbing hot steam, peppercorns are transported through a drum for extracting water from washed pepper before entering the drying system.

Step 7: Dry

The drying system uses 2 continuous levels including a tower of 2 drying layers: input layer and drying layer. The capacity for drying pepper is adjusted in line with the humidity of pepper to reach high productivity by using the system of carambola-shaped outlet screws. To maintain the aroma of pepper, the heat increasing system uses automatic gas spraying and burning heads, which ensures workers with industrial safety and prevents fire and explosion.

Step 8: Cool down after drying and classified

After being dried, peppercorns are transported to a tank for cooling down and then again to Catador to eliminate impurities including dust and pepper husks appearing after being dried. Then peppercorns are moved into the spiral-type classification machine (for the 2nd time).

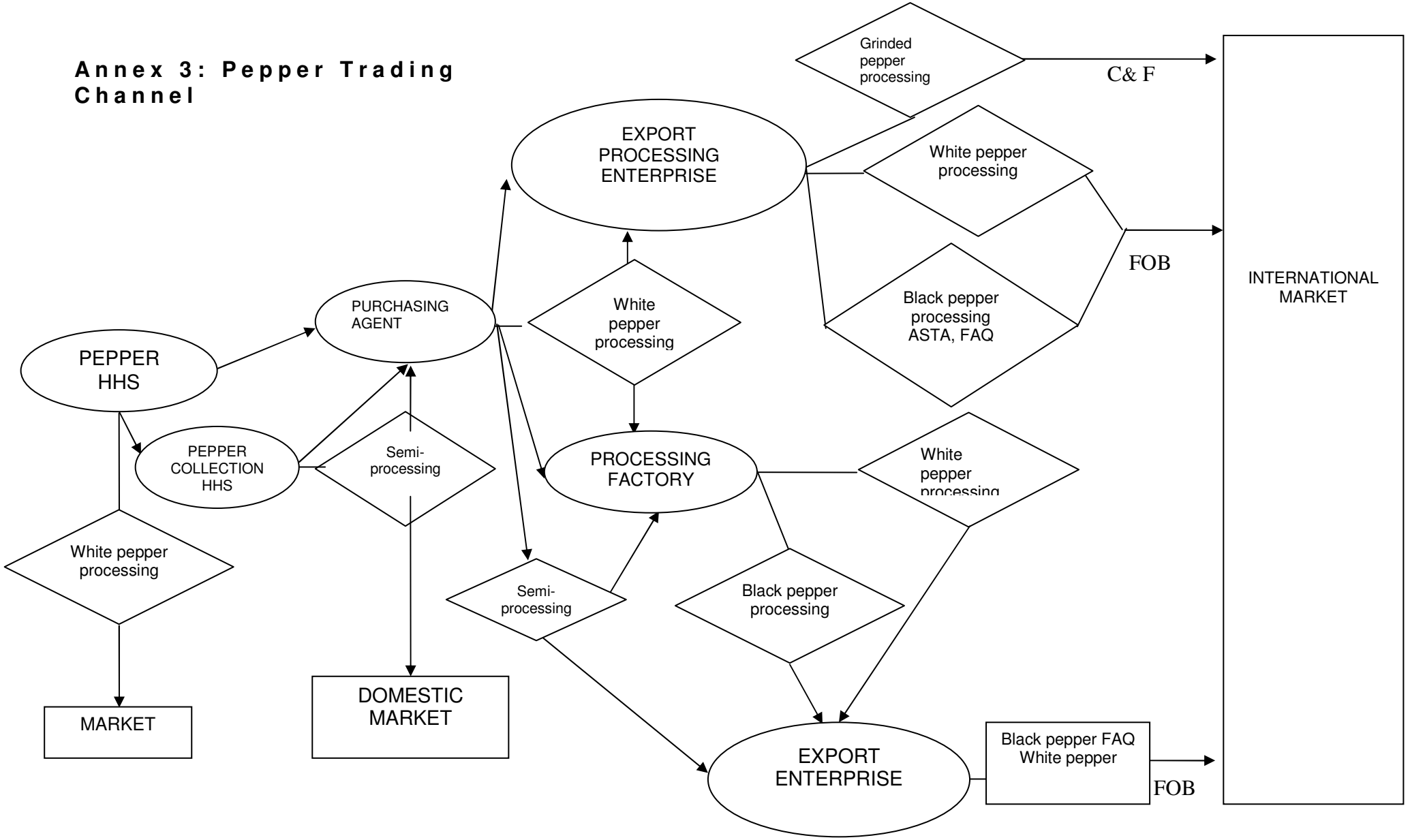
Step 9: Weigh automatically

The finished peppercorns are moved to container or to the automatic quantified scale system if required. The quantified scale is automatically controlled by an electronic system showing number with the amount from 30-60kg and the permitted error is from ± 45g/50kg and its capacity is 200bags /1 hour.

+ The achieved product: Clean black pepper of ASTA standard
+ Capacity: 4,000 tons/year

Currently, investment cost for this technology is: VND 6 billion.

Annex 3: Pepper Trading Channel



Annex 4a: Pepper product standard

Black pepper (*Piper nigrum* L.) – *Specification*

Scope of Application

This standard specifies for black pepper (Pepper nigrum L.) with grades of whole berry or ground as follows:

a. Pepper has not yet gone through some basic cleaning processes or has been partially cleaned, has not yet been processed or graded called "Non-processed or semi-processed pepper".

b. Pepper which has been cleaned, processed and/or graded is called "Processed pepper". In some specific case, they are sole directly to consumers.

When the term "Black pepper" is used independently, it means that the specification is applied for both the above two grades without any differentiation.

2. Standards Applied

- ISO 5564: 1982 Black pepper and white, whole or ground – Determination of piperine content – Spectrophotometer method.
- VNS 4045: 1993 Pepper – Testing methods.
- VNS 4829: 2001 (ISO 6579: 1993) Microbiology – General guidance of Salmonella detection methods.
- VNS 4830 – 89 (ISO 6888: 1983) Microbiology – General guidance of Staphylococcus aureus counting methods and bacteria counting technique.
- VNS 4882 – 2001(ISO 4831: 1991) Microbiology – General guidance of coli form quantity – Counting technique with max. probability.
- VNS 4889 – 89 (ISO 948: 1980) Spices sampling.
- VNS 4891 – 89 (ISO 927: 1982) Spices – Determination of extraneous matter's content and quality.
- VNS 5103 – 90 (ISO 5498: 1981) Foods and Agricultural products – Determination of Fibre content – General method.
- VNS 5484: 2002 (ISO 930: 1997) Spices – Determination of Ash not dissolving in acid.
- VNS 5486: 2002 (ISO 1108: 1992) Spices – Determination of Non-volatile ete extract.
- VNS 6846: 2001 (ISO 7251: 1993) Microbiology – General guidance of Determination of Coli form quality – bacteria counting technique.
- VNS 7038: 2002 (ISO 928: 1997) Spices – Determination of total ash.
- VNS 7039: 2002 (ISO 6571: 1984) Spices and vegetables – Determination of volatile oil content.
- VNS 7040: 2002 (ISO 939: 1980) Spices – Determination of moisture – Distilling method.

3. Definition

The standards are applied for the following terms:

3.1 Black pepper: dried berry with full cover of Piper nigrum Linnaeus plant.

3.2 Non-processed black pepper (NP): pepper has not yet gone through some basic cleaning processes, processed or graded before selling, and meeting the standards' requirements.

3.3 Semi-processed black pepper (SP): pepper has gone through cleaning before selling, and meeting the standards' requirements.

3.4 Processed black pepper: pepper has processed like cleaning, processing, grading, etc… before selling, and meeting the standards' requirements.

3.5 Black ground pepper (also called grey pepper): being ground up like flour without any substance added and meeting the standards' requirements.

3.6 Light berry: berries which their appearance look normal but without kernel.

3.7 Pinhead: berries with very small size can not grow.

3.8 Broken berry: berries are splitted into small pieces.

3.9 Extraneous matter: any thing does not belong to black pepper.

Note: light berry, pinhead and broken berry are not considered as extraneous matters.

4. Description

Whole black pepper is full berry of Piper nigrum L., which is harvested when it was matured already. Black pepper's normal size is from 3mm to 6mm with rumpled cover of brown, grey or black.

Depend on black pepper's bulk density; it is divided into 4 grades: special grade, grade 1, grade 2 and grade 3.

Black pepper in powder is ground-up pepper without any substance or extraneous matter added.

5. Specification

5.1 Sensitive requirements

- Taste: when being ground up like flour, black pepper has the specific taste: bitter and not strang smells.
- Black pepper has not mould and yeast, insects and part of dead insects which can be seen by eyes as well as by magnifier.

5.2 Physical and chemical requirements

5.2.1 Physical parameter of black pepper is shown in the table 1.

The table 1: Physical parameter of black pepper

Physical parameter	Requirements				
	Black pepper NP or SP				Processed
	Special	Grade1	Grade2	Grade3	
1. Extraneous matter (% by wt, max.)	0,2	0,5	1,0	1,0	0,2
2. Light berries (% by wt, max.)	2	6	10	18	2,0
3. Pinhead or broken (% by wt, max.)	2,0	2,0	4,0	4,0	1,0
4. Bulk density (g/l, min.)	600	550	500	450	600

5.2.2 Chemical parameter of black pepper is shown in the table 2.

Table 2: Chemical parameter of black pepper

Chemical parameter	Requirements		
	Black pepper NP or SP	Processed	Ground
1. Moisture (% by wt, max.)	13,0	12,5	12,5
2. Total ash (% by wt of dries, max.)	7,0	6,0	6,0
3. Non-volatile ete extract ((% by wt of dries, min.)	6,0	6,0	6,0
4. Volatile oil (% by wt of dries, ml/100g, min.)	2,0	2,0	1,0
5. Piperin (% by wt of dries, min.)	4,0	4,0	4,0
6. Non-volatile ash in acid (% by wt of dries, max.)	-	-	1,2
7. Fibre (Non-dissolve index, % by wt of dries, min.)	-	-	17,5

5.3 Microbiological requirements

Microbiological parameter of black pepper is shown in the table 3:

Table 3: Microbiological parameter of processed black pepper

Microbiological parameter	Limitation
1. Coli form (quantity per 1gam)	10^2
2. E.coli (quantity per 1gam)	0
3. Salmonella (quantity per 25gams)	0
4. S. aureus (quantity per 1gam)	10^2

6. Testing methods

6.1 Sampling according to VNS 4889 – 89 (ISO 948 : 1980).
6.2 Specify strange extraneous matter according to VNS 4891 – 89 (ISO 927 - 1982).
6.3 Specify Pinhead or broken according to VNS 4045 : 1993.
6.4 Specify light berry according to VNS 4045 : 1993.
6.5 Specify weight by volume according to VNS 4045 : 1993.
6.6 Specify total ash according to VNS 7038 : 2002 (ISO 928 : 1997).
6.7 Specify non-volatile dust in acid according to VNS 5484 : 2002 (ISO 930 : 1997).
6.8 Specify moisture according to VNS 7040 : 2002 (ISO 939 : 1980).
6.9 Specify non-volatile ete extract according to VNS 5486 : 2002 (ISO 1108 : 1992);
6.10 Specify fibre according to ISO 5103 : 1990.
6.11 Specify piperin content according to ISO 5564 : 1982.
6.12 Specify volatile oil according to VNS 7039 : 2002 (ISO 6571 : 1984).
6.13 Specify Coli form according to VNS 6848 : 2001 (ISO 4832 : 1991) or VNS 4882 : 2001 (ISO 4831 : 1991).
6.14 Specify E.coli according to VNS 6846 : 2001 (ISO 7251 : 1993).
6.15 Specify Salmonella according to VNS 4829 : 2001 (ISO 6579 : 1993).
6.16 Specify S.aureus according to VNS 4830 – 89 (ISO 6888 : 1983).

7. Label, Package, Transport and Storing

7.1 Label: do labeling according the Decision 178/1999/QDD-TTg and also specify product name according to item 3 of this regulation.
7.2 Package: Whole and ground peppers are packed in dry and clean bags preventing from absorbing moisture and evaporating.
7.3 Storing: store pepper in fresh, dry and clean place.
7.4 Transport: transport facilities must be dry, clean, not smell and do not effect on quality of pepper.

Regulation at Table 1:

Extraneous matter: all matters are not black pepper; broken berry: is split into pieces; pinhead: small berry and not able to develop; light berry: empty berry; black pepper, ground or grey pepper: black berry grinded into ground without any other substances and meets the needs of this standard; black pepper processed: peppercorns which are processed (be cleaned, classified and processed) before being selling and meets the needs of this standard; black pepper, semi – processed (SP): black peppercorn has been cleaned but not yet been processed or classified and meet this standard; black pepper, non – processed (NP): peppercorn which has not yet been cleaned, processed and classified before being selling and meets this standard; black pepper: dry peppercorn with peel, Piper nigrum Linneaus.

Annex 4b: Pepper product standard

White pepper (*Piper nigrum* L.) – Specification

1. Scope of Application

This standard specifies for white pepper (Piper nigrum L.), whole or ground in the following processes:

a. Semi-processed (SP);

b. Processed (P)

When the term "White pepper" is used independently, it means that this standard is applied for both the above two kinds of pepper without any differentiation.

2. Standards Applied

- ISO 5564: 1982 Black pepper and white, whole or ground – Determination of piperine content – Spectrophotometer method.
- VNS 4045: 1993 Pepper – Testing methods.
- VNS 4829: 2001 (ISO 6579: 1993) Microbiology – General guidance of Salmonella detection methods.
- VNS 4830 – 89 (ISO 6888: 1983) Microbiology – General guidance of Staphylococcus aureus counting methods and bacteria counting technique.
- VNS 4882 – 2001(ISO 4831: 1991) Microbiology – General guidance of coli form quantity – Counting technique with max. probability.
- VNS 4889 – 89 (ISO 948: 1980) Spices - sampling.
- VNS 4891 – 89 (ISO 927: 1982) Spices – Determination of extraneous matter's content and quality.
- VNS 5103 – 90 (ISO 5498: 1981) Foods and Agricultural products – Determination of Fibre content – General method.
- VNS 5484: 2002 (ISO 930: 1997) Spices – Determination of Ash not dissolving in acid.
- VNS 5486: 2002 (ISO 1108: 1992) Spices – Determination of Non-volatile ete extract.
- VNS 6846: 2001 (ISO 7251: 1993) Microbiology – General guidance of determination of Coli form quality – bacteria counting technique.
- VNS 7038: 2002 (ISO 928: 1997) Spices – Determination of total ash.
- VNS 7039: 2002 (ISO 6571: 1984) Spices and vegetables – Determination of volatile oil content.
- VNS 7040: 2002 (ISO 939: 1980) Spices – Determination of moisture – Distilling method.

3. Definition

The standards are applied for the following terms:

3.1 Black pepper: dried berries with full cover of Piper nigrum Linnaeus plant.

3.2 White pepper: dried berries with removed cover of Piper nigrum Linnaeus plant.

3.3 White pepper, semi-processed (SP): white berries have gone through cleaning processes before selling, and meeting the standards' requirements.

3.4 White pepper, processed (P): white berries are processed (cleaned, graded, processed, etc…) before selling, and meeting the standards' requirements.

3.5 White pepper, ground: white berries are ground up like flour without any substance added, and meeting the standards' requirements.

3.6 Black berry: berries are black and their covers have not yet removed completely.

3.7 Broken berry: berries are splitted into small pieces.

3.8 Extraneous matter: any thing does not belong to white pepper.

4. Description

4.1 Whole white pepper is produced by the two following ways:

a) Being produced from dried black berry of Piper nigrum L., which is picked up before it turns red totally, put into water at first if necessary, being removed cover then being dried.
b) Being produced from ripen berry of Piper nigrum L. and removed cover by the same above way.
White pepper is usually round, 3mm-6mm diameter, smooth appearance, flat top and its stem raise a little, and there are a lot of brown veins displaying from top to stem. The color of berry ranges from light grey to ivory.

4.2 Ground white pepper is processed by the way grinding down berries and no any substance added.

5. Specification
5.1 Sensitive requirements
- Taste: when being ground up like flour, white pepper has the specific taste: bitter and not strange smells.
- White pepper has not mould and yeast, insects and part of dead insects which can be seen by eyes as well as by magnifier.

5.2 Physical and chemical requirements

5.2.1 Physical parameter of black pepper is shown in the table 1.

The table 1: Physical parameter of white pepper

Physical parameter	Requirements	
	Semi-processed	Processed
1. Extraneous matter (% by wt, max.)	0.5	0.2
2. Broken berries (% by wt, max.)	4.0	3.0
3. Black berries (% by wt, max.)	15	10
4. Bulk density (g/l, min.)	600	600

5.2.2 Chemical parameter of white pepper is shown in the table 2.

The table 2: Chemical parameter of white pepper

Chemical parameter	Requirements	
	Semi-processed or Processed	Ground
1. Moisture (% by wt, max.)	13.0	12.5
2. Total ash (% by wt of dries, max.)	3.5	3.5
3. Non-volatile ete extract ((% by wt of dries, min.)	6.5	6.5
4. Volatile oil (% by wt of dries, ml/100g, min.)	1.0	0.7*
5. Piperin (% by wt of dries, min.)	4.0	4.0
6. Non-volatile ash in acid (% by wt of dries, max.)	-	0.3
7. Fibre (Non-dissolve index, % by wt of dries, min.)	-	6.5
* Volatile oil is specified after grinding		

5.3 Microbiological requirements
Mircrobiological parameter of white pepper is shown in the table 3:

The table 3: Microbiological parameter of processed white pepper

Microbiological parameter	Limitation
1. Coli form (quantity per 1gam)	10^2
2. E.coli (quantity per 1gam)	0
3. Salmonella (quantity per 25gams)	0
4. S. aureus (quantity per 1gam)	10^2

6. Testing methods

6.1 Sampling according to VNS 4889 – 89 (ISO 948 : 1980).
6.2 Specify strange extraneous matter according to VNS 4891 – 89 (ISO 927 - 1982).
6.3 Specify Pinhead or broken according to VNS 4045 : 1993.
6.4 Specify light berry according to VNS 4045 : 1993.
6.5 Specify weight by volume according to VNS 4045 : 1993.
6.6 Specify total ash according to VNS 7038 : 2002 (ISO 928 : 1997).
6.7 Specify non-volatile dust in acid according to VNS 5484 : 2002 (ISO 930 : 1997).
6.8 Specify moisture according to VNS 7040 : 2002 (ISO 939 : 1980).
6.9 Specify non-volatile ete extract according to VNS 5486 : 2002 (ISO 1108 : 1992);
6.10 Specify fibre according to ISO 5103 : 1990.
6.11 Specify piperin content according to ISO 5564 : 1982.
6.12 Specify volatile oil according to VNS 7039 : 2002 (ISO 6571 : 1984).
6.13 Specify Coli form according to VNS 6848 : 2001 (ISO 4832 : 1991) or VNS 4882 : 2001 (ISO 4831 : 1991).
6.14 Specify E.coli according to VNS 6846 : 2001 (ISO 7251 : 1993).
6.15 Specify Salmonella according to VNS 4829 : 2001 (ISO 6579 : 1993).
6.16 Specify S.aureus according to VNS 4830 – 89 (ISO 6888 : 1983).

7. Label, Package, Transport and Storing

7.1 Label: do labeling according the Decision 178/1999/QDD-TTg and also specify product name according to item 3 of this standard.
7.2 Package: Whole and ground peppers are packed in dry and clean bags preventing from absorbing moisture and evaporating.
7.3 Storing: store pepper in fresh, dry and clean place.
7.4 Transport: transport facilities must be dry, clean, not smell and do not effect on quality of pepper.

Annex 4c Grade of whole pepper, black and white

	QUALITY PARAMETER	BLACK PEPPER		WHITE PEPPER	
		IPC BP-1	IPC BP-2	IPC WP-1	IPC WP-2
	MACRO				
1.	Moisture (% vol/weight, maximum)	12	14	13	15
2.	Bulk Density (g/l minimum)	550	500	600	600
3.	Light Berries/Corns (% by weight, maximum)	2	10	1	2
4.	Extraneous Matter (% by weight, maximum)	1	2	1	2
5.	Black Berries/Corns (% by weight, maximum)	Not applicable	Not applicable	1	2
6.	Mouldy Berries/Corns (% by weight, maximum)	1	3	1	3
7.	Insect Defiled Berries/Corns (% by weight, maximum)	1	2	1	2
8.	Whole Insects, Dead (by count, maximum)	Not more than 2 numbers in each sub sample and not more than 5 numbers in total sub-samples.		Not more than 2 numbers in each sub sample and not more than 5 numbers in total sub-samples.	
9.	Mammalian or/and Other Excreta (by count, maximum)	Shall be free of any visible mammalian or/and other excreta		Shall be free of any visible mammalian or/and other excreta	
1.	**MICROBIOLOGICAL** Salmonella (detection/25g)	Negative	Negative	Negative	Negative

NOTES:
(a). IPC BP-2 and IPCWP-2 are grades of pepper, which has been partially processed (ie. has gone through some basic cleaning processes like sieving and winnowing).
(b). IPC BP-1 and IPC WP-1 are grades of pepper, which has been further processed (ie. has gone through further cleaning processes including sieving, cycloning, destoning, washing and mechanical drying).

IPC GRADE OF TREATED WHOLE PEPPER, BLACK AND WHITE

	QUALITY PARAMETER	BLACK PEPPER		WHITE PEPPER	
		IPC BPT-1	IPC BPT-2	IPC WPT-1	IPC WPT-2
	MACRO				
1.	Moisture (% vol/weight, maximum)	12	12	12	12
2.	Bulk Density (g/l minimum)	550	500	600	600
3.	Light Berries/Corns (% by weight, maximum)	2	10	1	2
4.	Extraneous Matter (% by weight, maximum)	1	2	1	2
5.	Black Berries/Corns (% by weight, maximum)	Not applicable	Not applicable	1	2

6.	Mouldy Berries/Corns (% by weight, maximum)	Nil	Nil	Nil	Nil
7.	Insect Defiled Berries/Corns (% by weight, maximum)	1	2	1	2
8.	Whole Insects, Dead (by count, maximum)	Not more than 2 numbers in each sub sample and not more than 5 numbers in total sub-samples.		Not more than 2 numbers in each sub sample and not more than 5 numbers in total sub-samples.	
9.	Mammalian or/and Other Excreta (by count, maximum)	Shall be free of any visible mammalian or/and other excreta		Shall be free of any visible mammalian or/and other excreta	
	MICROBIOLOGICAL				
1.	Aerobic Plate Count (cfu/g, maximum)	$5x10^4$	$5x10^4$	$5x10^4$	$5x10^4$
2.	Mould & Yeast (cfu/g, maximum)	$1x10^3$	$1x10^3$	$1x10^3$	$1x10^3$
3.	Escherichia coli (MPN/g)	<3	<3	<3	<3
4.	Salmonella (detection/25g)	Negative	Negative	Negative	Negative

(a). IPC BPT-1 and IPC WPT-1 are grades of pepper, which has been processed ie. pepper has gone through further cleaning processes including sieving, cycloning, destining, washing and mechanical drying, and has subsequently undergone an internationally accepted treatment process to reduce its microbiological contamination.
(b). IPC BPT-2 and IPC WPT-2 are grades of pepper, which has been partially processed (ie. has gone through some basic cleaning processes like sieving and winnowing), and has subsequently undergone an internationally accepted treatment process to reduce its microbiological contamination.
(c). The treatment process shall be undertaken by qualified/ trained personnel, in compliance with internationally accepted standard operational procedures and regulations regarding the process.
(d). The treated pepper shall by packages in suitable, clean and sterile packaging materials, clearly labeled to indicate, *inter alia*, the treatment process as required by standard regulations, and appropriately handled and stored in a clean and well-ventilated store to protect and maintain the integrity of the product for the entire period of its intended shelf-life.
(e). Cfu = Colony-Forming Unit
(f). MPN = Most Probable Number