

# A research on the introducing the waterproof corrugated cardboard box for the efficient shipment of chinese cabbages and radishes: Focusing on Garak-dong wholesale market as the center

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## Abstract

It is possible to use pallet for forwarding as chinese cabbages and radishes are general large-scale trading items at the agricultural wholesale market though, however, most of these are forwarded as it have packed in net bags or in P-E bags. Thus, it is still hard for palletizing. The type of packing the product in the net bag makes it difficult for palletizing. It is not a stable shape enough and easily collapsed for pallet loading. Because of this collapsibility, the corrugated cardboard box is being used to enhance forwarding efficiency, but the existing corrugated cardboard box could be crushed easily by moist what is from the agricultural product's property and it also could be squashed by the mass of the loaded box layers on itself.

In contrary, the functional waterproof corrugated cardboard box is not collapsed through palletizing and it is efficient for product management with it's ventilation function in respond to pre-cooling effect. Furthermore, because it has various functional shapes as the open type, the partition type and so on, it is effective for maintaining freshness of the product and standardizing the distribution of agricultural product. It is well-known that it is possible to introduce this box to cargo-works of agricultural product.

Consequently, the recognition of main distributors about the pallet distribution of the chinese cabbage and the radish was apprehended in this study for activating mechanization of loading and unloading. The survey was conducted to the main distributors such as the forwarder, the auction dealer and the commission merchant with Garak-dong wholesale market as the center. The appropriate packing materials and problems of the existing method for loading and unloading were derived through the survey. Especially, it was focused on analyzing the difference of recognition between the subject groups for the way of using waterproof cardboard corrugated box to deal with the difficult product for packing in normal corrugated box because of the box's absorption of moist from the agricultural product like a chinese cabbage and a radish.

Total In the cases of the forwarders and the commission merchants, the net was highly responded as 45%, 74% from each groups

for the best packing material for mechanization of distribution and the waterproof corrugated cardboard box was responded as 20%, 22% from each groups as much preferable than multi-stage wooden box. However, for the radish, the waterproof corrugated cardboard box was the best material as 56%, and the auction trader group supported it for 80%. So, the using the waterproof corrugated cardboard box for mechanization of distribution was negative for the chinese cabbage, but it was positive for the radish.

The average was 2.42, the standard deviation was 1.24. The negative response(about 55%) was prevailing more than positive response(about 23%). It could be analyzed that even there was the positive recognition for using the waterproof corrugated cardboard box for the radish though the preference for low price of net bag in the chinese cabbage forwarding procedure. Still now, it seems that is a burden for using the waterproof corrugated cardboard box with high price.

In the analysis on the recognition differences about using the waterproof corrugated cardboard box for the chinese cabbages and the radish between the forwarders and the commission merchants, generally the negative recognition was prevailing, but the forwarders(2.696) were more positive for using the waterproof corrugated cardboard box than the commission merchants(2.145).

Keywords : Waterproof corrugated cardboard box, Garak-dong wholesale market, Analysis of the recognition differences

## I. Introduction

The problem of agricultural product distribution system is a much discussed issue due to the so called "the crisis of chinese cabbage" based on the inflated price of chinese cabbage in 2010. Also, the discussion for improvement of agricultural product distribution is another hot topic in the same vein.

However, because of the abnormal climate changes such as the cold-wether damage, frequent heavy snow and cold waves in last winter, there was a serious setback for the chinese cabbage production in Heanam-gun, Jeollanam-do, South Korea where the 70% of the whole winter chinese cabbage production amounts were made. Thus, the price of a chinese cabbage dropped to about 2000 won in the middle of December 2010. In spite of that facts, the actual price of a chinese cabbage was inflated up to 5000 won in march 2011,

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then it dropped to under 1000 won again in October 2011. These kind of unstable price fluctuations alternating jump and slump have been repeated by the wrong demand forecasting and harmful consequences of distribution system.

The South Korean government has been suggested numerous politics for stabilization of the chinese cabbage price in various aspect to deal with it though, it seems like that the approachment with the point of fundamental view is required to resolve those.

It was, of course hard to forecast those kind of reduction for producing amount by the abnormal climate and that was the main factor of the result, but it is necessary to cut down the logistical expenses by refining the agricultural product distribution system as well as improving the efficiency of it.

In meantime, the ways for improving the efficiency of fresh food products including agricultural products have been researched a lot and the usage of pallet for mechanization of distribution work has been empathized. Yoon(2002) suggested that the effects such as reduction of transporting hours, effectiveness of cargo-working, work efficiency improvement, reduction of packing charge and storage efficiency improvement by establishing the Unit Load System. In addition, Kim et al.(2002) insisted that reduction of distribution expenses and improvement of distribution service are the essential conditions for gaining competitiveness of the distribution corporate.

Furthermore, the government has been conducting political supports according to the established goal as raising the forwarding rates of pallet in the wholesale markets, for instance, the department of agriculture, forestry and fisheries planned to increase the mechanization for cargo handling up to 50% until 2013. However, it seems that the purpose could not be succeeded perfectly because of the low forwarding rates with pallet in the wholesale market, especially for the cases of chinese cabbages or radishes that the real difficult things for palletizing because of their shapes would be hard for proceeding the palletization. Currently, it is possible to use pallet for forwarding as chinese cabbages and radishes are general large-scale trading items at the agricultural wholesale market though, however, most of these are forwarded as it have packed in net bags or in P-E bags. Thus, it is still hard for palletizing. The type of packing the product in the net bag makes it difficult for palletizing. It is not a stable shape enough and easily collapsed for pallet loading. Because of this collapsibility, the corrugated cardboard box is being used to enhance forwarding efficiency, but the existing corrugated cardboard box could be crushed easily by moist what is from the agricultural product's property and it also could be squashed by the mass of the loaded box layers on itself.

In contrary, the functional waterproof corrugated cardboard box is not collapsed through palletizing and it is efficient for product management with it's ventilation function in respond to pre-cooling effect. Furthermore, because it has various functional shapes as the open type, the partition type and so on, it is effective for maintaining freshness of the product and standardizing the distribution of agricultural product. It is well-known that it is possible to introduce this box to cargo-works of agricultural product.

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distribution of the chinese cabbage and the radish was apprehended in this study for activating mechanization of loading and unloading. The survey was conducted to the main distributors such as the forwarder, the auction dealer and the commission merchant with Garak-dong wholesale market as the center. The appropriate packing materials and problems of the existing method for loading and unloading were derived through the survey. Especially, it was focused on analyzing the difference of recognition between the subject groups for the way of using waterproof cardboard corrugated box to deal with the difficult product for packing in normal corrugated box because of the box's absorption of moist from the agricultural product like a chinese cabbage and a radish. The result from this analysis would suggest the implications supporting the future introduction of waterproof corrugated cardboard box.

## II. Theoretical background

### 1. The advanced research

For the existing researches on the distribution of the agricultural product, Moon et al.(2000) researched on analyzing of the success and the usage state of the agricultural product distribution centre by surveying. Han(2010) analyzed the current state of the agricultural product distribution expenses and researched about the states of transporting, packing, loading, unloading and management of producing district facilities then suggested the measures for improving the agricultural product distribution system. Furthermore, Kim and Choi(2004) suggested that the need of open access to the agricultural product distribution materials and the ways for improving those. They concluded that the pallet-loading forwarding method would make the mechanization of loading and unloading possible as well as achieving outcomes within short period. Lee(2008) suggested to establish the strengthen agricultural product distribution system by analyzing the profit structure of producer and distribution expenses in the aspect of the producing district through the surveys to the producer about the receiving price, distribution expenses and the usage of distribution centre in producing district. Kim et al.(2008) introduced the distribution and producing state of the chinese cabbage and the radish in domestic scope and in overseas related with the Kimchi industry as the final products from the chinese cabbage or the radish. And they also suggested the long term development measure for Kimchi industry as well as the chinese cabbage and the radish through the delphi survey. Kim(2007) researched on the activation ways for packing and forwarding of the chinese cabbage and the radish following by the overall implementation of packing distribution of the them.

There were lots of studies on the competitiveness reinforcement of the agricultural wholesale market focusing on indicating the problems of packing, forwarding, loading, unloading, transporting and facilities. Jeon(2003) pointed out the problem such as the inefficient distribution system of wholesale market, insufficient and inappropriate distribution facilities and the lack of dealing with the rapidly changing distribution environment. He empathized on replacing the existing man

labor dependent loading way to mechanized loading and it's palletized forwarding. He also pointed the difficulties of establishing low-temperature distribution system because of lack of essential facility and low temperature storage facility. The functional limitation of the existing facilities from deterioration.

Huh(2000) indicated the demanding of transporting work and several loading-unloading work inside of the wholesale market as the inefficient factor in the aspect of distribution system. The problems are that most of works are dependent for human labor, thus the work efficiency is low. Also, it cost more on distribution because of the high unloading fee. He asserted that the reduction of expenses could be achieved by the promotion of loading-unloading work through the mechanization, the improvement of policy on listing fee with mass trading unit in wholesale market.

Kim(2002) asserted that the wholesale market facility and equipment were induced without considering the standardization of distribution, then it is distracting the efforts for improving distribution and pre-cooling in producing district. The small scale of commission merchant cause the difficulties for improving distribution. The distribution system is insufficient for standardizing between the forwarding unit, transporting unit and sales unit and it costs distribution fees excessively. This facts cause the high costing structure of wholesale market. The reinforcement of distribution function and the reorganization of distribution system are required for the distribution efficiency.

Jeon(2007) empathized on the need of organizing the distribution system because of the lack of storages for packing-processing and storage in the agricultural wholesale market. Kim(2001) suggested the improvement of loading-unloading management by establishing data processing system in the wholesale market.

Especially, Wang et al.(2006) analyzed the standard unit packing forward measure of chinese cabbage-the radish through surveying, it was concentrated on researching the intention of participation for packing business, recognition on packing forward of the product and suitable packing materials. The subjects were divided into two different groups as distributor in producing district group and commission merchant group. The cost-benefit analysis was conducted according to the packing material, then he suggested the way for achieving mechanization of loading-unloading and packing forwarding. However, the subjects were limited only for the producing district group and the commission merchant group. Even the products are going through the trading process in the wholesale market though, there was not any of the trader group's opinion and the surveys was with the non-waterproof corrugated cardboard box. So, this study was focusing on analyzing the recognition differences between each groups about using waterproof corrugated cardboard box according to the surveys on it.

## 2. Current trading status of the chinese cabbage-radish

<Table 1> is the analysis outcome of the chinese cabbage and the radish trading trends in the Garak market for a decade(1999~2008) completed by reconstituting statistical data from the Seoul Agricultural & Marine Product Corporation. The chinese cabbage presented 100,383 million won as sum of trades and 262,622 tons in annual

mean by a decade. The radish presented 60,627 million won as sum of trades and 173,041 tons in annual mean by a decade. The average trading quantity in a day and amount is calculated with 307 days as the actual annual trading days by excluding holidays and sundays. In the case of the chinese cabbage, 855 tons and 327 million won in daily average and for the radish, it was 564 tons and 197 million won.

<Table 1> Average year volume of chinese cabbages-radishes

Product Type	Average of year				Daily Average	
	quantity (ton)	%	Sum (million won)	%	quantity (ton)	Sum (million won)
Radish	173,041	8.1	60,627	2.7	564	197
Chinese cabbage	262,622	12.2	100,383	4.5	855	327
Agricultural product total	2,144,756	100	2,235,788	100	6,986	7,283

<Table. 2> is presenting the specific gravity of major 12 green grocery items's quantity and price at Garak whole sale market in 2008. In the aspect of quantity, chinese cabbages was ranked No. 1 with 10.3% of occupation ratio and radishes was followed it as No. 3 product with 8.3%. For the aspect of price, chinese cabbages was ranked No. 9 with 3.3% and radishes was No. 10 with 2.6%.

<Table 2> The specific gravities of chinese cabbages-radishes in Garak wholesale market's major green groceries(2008)

구분	Quantity (ton)	%	Ranking	Sum (million won)	%	Ranking
Chinese cabbage	211,034	10.3	1	67,930	3.3	9
Onion	188,855	9.2	2	127,194	6.2	2
Radish	170,753	8.3	3	54,081	2.6	10
Welsh onion	103,905	5.0	4	119,559	5.8	4
Cucumber	103,714	5.0	5	110,797	5.4	5
Potato	85,327	4.1	6	75,519	3.7	8
Cabbage	78,518	3.8	7	28,118	1.4	12
Squash	76,303	3.7	8	82,188	4.0	7
Mushroom	51,059	2.5	9	120,007	5.8	3
Green chilli	50,173	2.4	10	142,536	6.9	1
Garlic	44,292	2.1	11	84,272	4.1	6
Carrot	41,374	2.0	12	33,843	1.6	11

Source: Seoul Agricultural & Marine Products Corporation (<http://www.garak.co.kr/>)

It could be figured that chinese cabbages-radishes got quiet low price specific gravities as 5.9% compared with it's quantity specific gravities as 18.6% in the whole green grocery item lists. The reason why it has much lower price specific gravity compared with quantity specific gravity is that chinese cabbages-radishes got much bigger volume compare with other green groceries, consequently, it cost much more for packing, processing, transporting, obsolescence cleaning, loading, unloading, storage, distribution management and so on. It means that it requires quiet lots of endeavors for keeping the distribution efficiency of chinese cabbages-radishes.

According to the computation result from the South Korea Agriculture and Fisheries Trade Corporation(2008), the distribution efficiency of the chinese cabbage was 72.5%, the radish showed 64.9%. It is quiet inefficient ratio comparing with the ratio of other agricultural products such as garlics 43.3%, onions 43.8%, apples 49.0%, pears 34.4%, grapes 58.5%, mandarins 59.2% and so on. Also, even in comparison with the average ratio of whole items as 52.5, it is still having low distribution efficiency.

In the case if Japan, the quantity specific gravities of main green grocery items in the wholesale market for 2007 suggested the cabbage as No.1, then the onion as No.2, the radish as No.3 and chinese cabbage as No.4. The specific gravity of cabbages was higher than Garak wholesale market's. But it was similar results for trends of the lower price specific gravity than quantity specific gravity as the quantity specific gravities of chinese cabbages and radishes were 8.0% and 9.5% each, then those the price specific gravities were 2.4% and 3.7%.

<Table 3> The specific gravities of chinese cabbages and radishes in the Japan wholesale market's green grocery items.(2007)

구분	Quantity (10,000 ton)	Sum (100 million yen)	wholesale price (yen/kg)	Ratio	
				Sum (%)	wholesale price (%)
Radish	109	786	72	9.5	3.7
Chinese cabbage	92	498	54	8.0	2.4
Onion	120	904	75	10.5	4.3
Cucumber	57	1,496	264	5.0	7.1
Potato	77	716	94	6.7	3.4
Cabbage	141	1,076	76	12.3	5.1
Welsh onion	36	1,103	303	3.1	5.2
eggplant	33	904	277	2.9	4.3
tomato	53	1544	291	4.6	7.3
green pepper	17	645	389	1.5	3.1
spinach	16	669	409	1.4	3.2
Carrot	72	685	95	6.3	3.2
sweet potato	9	209	235	0.8	1.0
Vegetables total	1,145	21,161	185	100.0	100.0

Source: Japanese MAFF(Ministry of Agriculture, Forestry and Fisheries)  
(<http://www.maff.go.jp/>)

### 3. Trading property of the chinese cabbage · the radish

First, the quantity specific gravities of the chinese cabbage and the radish is quite high. As it had suggested above in <table 1> and <table 2>, the average quantities of the chinese cabbage and the radish were 20.3% in the whole items, it was continuously high in 2008 as 18.6%. Because the chinese cabbage and the radish are the main elements for KIMCHI the korean representative dish dependent for the amount of the chinese cabbage and the radish. It means that it is the main measure affecting the finance of ordinary people with the rice as their staple food.

Consequently, the shortage of chinese cabbages will evoke the inflated price of it, then it would be developed as a serious social problem and also, it affects the inflation of alternative item's price as a radish.

As one of the effort to increase the supply of the chinese cabbage and the radish for stabilizing it's price, if the sowing areas gets expanded without practical plan, it is obvious that the price of the chinese cabbage and the radish will drop excessively because of the oversupplying problem, then the cultivated land would be destroyed. It goes back to the same point regardless of the all of efforts and repeats the bad circumstance.

Second, It occurs sometime that the auction price of the chinese cabbage and the radish are not even cover the transportation expenses because of the slumps in it's price. Furthermore, some distributors are decried as if they are taking unfair profits because of the wrong recognition that the chinese cabbage and the radish are high-margin items meaning the large gap between the consumer's paying price and the producer's receiving price. Normally, the distributor of producing district purchases the chinese cabbage and the radish by the vegetable yard with paying about 30% of contract fee after a month later from the formal contract. that distributor of producing district pays a certain amount of expenses to farmers for cultivating and managing the products around a month, then forwards those. So, this kind of forwarding structure costs way more of the distribution margin than a farmer does it by himself.

Third, the trading way of the chinese cabbage and the radish in wholesale market goes through the night auction procedure. In the case of the Garak market, the most representative wholesale market in South Korea, the auction starts from 23:00 pm then it last for about an hour. And the wholesale market corporation is charging 5% of the listing fee. The commission merchant opens normally for around 23:00 pm ~ 9:00 am on the next day, but the province merchant and the bulk demanding market opens from 23:00 pm ~ 02:00 am on the next day, the general retail market and vehicle vendor are trading after 5:00 pm. About 30% of delivered product in Garak market are sold by the kimchi factories.

Fourth, there are some properties from the loading and unloading system and from types of packing. The extra delivery processes are not required for the chinese cabbage and the radish and usually it is not unloaded at once but for the sales because of that those are sold as the auction items on vehicle by loaded in the truck. Some conflicts about collecting forwarding fee occur sometimes because, gen-

erally, those products are unloaded by the commission merchant or by the middle seller directly in the case for small amount of sales. Moreover, some parts of storage chinese cabbages and HAENAM chinese cabbages are forwarded in the package of corrugated cardboard box though, most of those products are forwarded in net bag package. Especially, in the case of the radish, there is some forwarding records with the corrugated cardboard box for summer season but the P-E(Polyethylene) burlap bag is the main material for packing in other seasons including autumn. The conditions for the palletizing are getting facilitated with the increasing trend of rates packing in the corrugated cardboard box in the case of the radish though, still the forwarding in a net bag is a main obstacle of palletizing for the chinese cabbage.

#### 4. The problem of forwarding the chinese cabbage-radish

The chinese cabbage had been forwarded by loading it as a non-packing item on the truck until 2005 in the Garak market. This product had been evoked environmental problem because of it's trash producing factor, thus the Seoul Agricultural & Marine Product Corporation prohibited the product forwarding of the chinese cabbage since January 1st 2006, then those products were started to being packed in the net bag. The garbage amount from fruits and vegetable in Garak market and 100.034 tons for 2005 by the time that the chinese cabbages were being forwarded as a product, however, from the first year of changing the way of packing it to the net bag package method, the garbage amount decreased up to 38,9561 tons 2006, then 23,067 tons for 2007, 19.815 for 2008. The garbage producing amount has been decreased quiet a lot and this net bag packing of the chinese cabbage has been contributed to the market environment. Generally, the chinese cabbage are forwarded by loading about 800~850 nets in 1 five-ton truck with three of chinese cabbages in one net. But the net bag package is not a tetragonal shape and this fact makes it's palletizing impossible because it simply rolled off from the pallet. Also, the high moist content in the chinese cabbage makes the palletizing quiet difficult even with the usage of corrugated cardboard box because of it's possibility of deformity from the moist. It could be a quiet decorated packing for the chinese cabbage with their price between 4,000~5,000 korean won for three. Because of the corrugated cardboard box's producing cost is expensive.

It is about the same situation for the radish. It also rolled off easily from the pallet when it is being loaded because of it non-tetragonal shape from being packed in the P-E(Polyethylene). Recently, the trend of forwarding the radish in a corrugated cardboard box with 18~20kg in one unit is getting dominant even with the fact that the high cost of packing in corrugated cardboard box. Because it could reduce the operating costs in the producing district. Of course, there are some problems with this method such as the over-packed phenomenon of the box that the box with the fixed size was packed with radishes regardless of their sizes, but still, there is the major merit for using it that it is not so getting affected from the moist.

#### 5. The necessity of waterproof corrugated cardboard box

As it mentioned above, the existing corrugated cardboard box for palletizing of the chinese cabbage and the radish is difficult to use because the moist absorption of the corrugated cardboard box inducing deformity of itself. Especially, the cabbage from the alpine region and the summer seasonal cabbage forwarding from the end of march to the middle of may are real difficult for packing because of it's high moist content. Consequently, the need of waterproof corrugated cardboard box to make up the faults of the existing one.

The waterproof corrugated cardboard box is the normalized name for all kinds of property deterioration for the water and it divided into three type as water repellency corrugated cardboard box, water resistant corrugated cardboard box and walter barrier corrugated cardboard box.

The water-repellency corrugated cardboard box is processed it's surface for preventing the moist osmotic reaction by letting the water drops roll off from it when it contacted just for awhile. The water resistant corrugated cardboard box is effectful for the long-term exposure to the water by making it to keep functioning in the water with a liner board, a corrugated center original board, glue or with the double processed corrugated cardboard. The walter barrier corrugated cardboard box is made with waterproof corrugated cardboard or non-water penetrating cardboard even it exposed to the water for long-period.

Park(2005) analyzed the appropriate specification of corrugated cardboard box as R10 for wax dipping or water repellency or more, above 650kgf for compression strength and the S-C-P(Semi Chemical Paper) for the corrugated paper. Lee(2009) suggested the need of waterproof corrugated cardboard for loading and unloading the chinese cabbage and the radish.

<Fig. 1> is the top open type waterproof corrugated cardboard box based on the shape of the grape and the plum box as the model. It is available for loading and unloading of the chinese cabbage and the radish. The standard of the existing waterproof corrugated cardboard box is 550mm(length) ×366mm(width) ×200±40mm(height), this size could evoke protruding phenomenon when it is loaded in several layers. Thus it would be effectful for loading those with forklift, if the length get shorten for about 10mm and the width for 6mm.

Currently, the representative case of forwarding the chinese cabbage by using corrugated cardboard box in Garak wholesale market is 'Suldongi' the brand of winter season in Haenam region from Haenam Green Distribution. co. as the <Fig. 2> shown above. The survey showed that this company is forwarding the product by loading about 1,000 boxes in the axis cargo vehicle without palletizing because of the difficulty of waterproofing.



<Figure 1> waterproof corrugated cardboard box



<Figure 2> Package of waterproof corrugated cardboard box

ing-unloading were operated with the five point criterion Likert technique. The statistical analysis was conducted with SPSS WIN 12.0. It would be expected that this research on various forwarder's recognition on loading-unloading matter of the chinese cabbage-radish, recognition differences and it's analysis would be useful for establishing future development measure of agricultural product distribution system.

### 1. Subject survey on the forwarder group

Total 70 forwarders were participated in this survey. The forwarder's annual forwarding sizes with 4.5 tons vehicle standard were responded as under 201~300 vehicles were 42.9%(30pp), under 101~200 vehicles were 32.9%(23pp), under 31 ~100 vehicles were 14.3%(10pp), more than 500 vehicles were 4.7%(4pp), under 301~400 vehicles were 1.4%(1p), under 401~500 vehicles were 1.4%(1p), under 30 vehicles were 1.4%(1p). Most of them showed forwarding size under 300 vehicles.

<Table 4> The annual forwarding size

number of vehicles	under 30	31 - 100	101 - 200	201 - 300	301 - 400	401 - 500	more than 500	Total
number of response	1	10	23	30	1	1	4	70
%	1.4	14.3	32.9	42.9	1.4	1.4	4.7	100.0

## III. Empirical Analysis

The application of palletizing on forwarding the chinese cabbage and the radish was researched in this study. The subjective location was Garak wholesale market and the reason why the use of pallet is hindered and the problems on net bag packing the most generalized packing method were surveyed. Also, the current state of recognition and the recognition differences between the groups about using waterproof corrugated cardboard box were analyzed as well as surveying the suitable material for palletizing the chinese cabbage and the radish.

The survey was conducted by post to 70 forwarders belonging to the producing district distributor association in the Garak market. 20 of auction traders and 72 commission merchants were interviewed one by one separately.

The current existing problems of packing and transporting the chines cabbage and the radish as well as the possible solutions were researched in pre-research for constructing the survey. The erosion phenomenon of the chinese cabbage, the problem that net bag is not fit in the standard and the problem of the unloading location were suggested. For the possible solution, the development of refrigerating vehicle, the development of new packing materials with high maintaining capacity and so on were suggested. Thus the survey was constituted according to these results. The survey on the usage of waterproof corrugated cardboard box and on the problem in net bag load-

Currently, the major problem of net bag the existing packing material for the chinese cabbage was responded as over demanding of labor costs 58.6%(41pp), the denaturation on transporting and the product erosion from contacting net 24.3%(17pp), the environmental pollution after using the net 10.0%(7pp), the problems on hygiene and storage 4.3%(3pp) and no response 2.8%(2pp). The high cost of working labor was the main problem.

<Table 5> The problem on forwarding with net bag

Packing material	Number of response	Percent(%)
Over demanding of labor costs	41	58.6
Erosion & Denaturation	17	24.3
Environmental pollution	7	10.0
Problems on hygiene and storage	3	4.3
Et cetera	2	2.8
Total	70	100

The survey on asking suitable material for palletizing the chinese cabbage was responded as the net bag 45.7%(32pp), folding type plastic box 28.6%(20pp), corrugated cardboard box 20.0%(14pp), multi-stage wooden box 1.4%(1p), etc 1.4%(1p) and no response 2.9%(2pp).

&lt;Table 6&gt; The suitable packing material for palletizing the chinese cabbage

Packing material	Number of response	Percent(%)
Net bag	32	45.7
Corrugated cardboard box	14	20.0
Folding type plastic box	20	28.6
Multi-stage wooden box	1	1.4
No response	2	2.9
Et cetera	1	1.4
Total	70	100

The survey on asking suitable packing material for palletizing the chinese cabbage was responded as corrugated cardboard box 55.7%(39pp), folding type plastic box 30.0%(21pp), burlap bag(PP, PE) 11.4%(8pp) and no response 2.9%(2pp). The waterproof corrugated cardboard was highly responded.

&lt;Table 7&gt; The appropriate packing material for the radish on palletizing

Packing material	Number of response	Percent(%)
Corrugated cardboard box	39	55.7
Burlap bag	8	11.4
Folding type plastic box	21	30.0
Multi-stage wooden box	0	0.0
No response	2	2.9
Total	70	100

## 2. Subject survey on the auction trader group in wholesale market corporate

Total 20 auction traders were participated in this survey. Generally, the reason why the mechanization through the pallet for the chinese cabbage and the radish as the mass trading items was responded as the lack of unloading space 45.0%(9pp), the erosion of the chinese cabbage 20.0%(4pp), inadequate working environment in producing district 15.0(3pp), the government's indifference, lack of unloading labor 10.0%(2pp).

&lt;Table 8&gt; The reason why the chinese cabbage and the radish could not be palletized

The reason	Number of response	Percent(%)
The lack of unloading space	9	45.0
The erosion of the chinese cabbage	4	20.0
Inadequate working environment in producing district	3	15.0
The government's indifference	2	10.0
Lack of unloading labor	2	10.0
Total	20	100

The survey on asking the suitable packing material for palletizing the chinese cabbage was responded as waterproof corrugated cardboard box 80.0%(16pp), wooden box 10.0%(2pp), box available for recycling 10.0%(22). the waterproof corrugated cardboard box was highly responded.

&lt;Table 9&gt; suitable packing material for palletizing the chinese cabbage

Packing Material	Number of response	Percent(%)
waterproof corrugated cardboard-board box	16	80.0
Multi-stage wooden box	2	10.0
Available for recycling	2	10.0
Total	20	100

## 3. Subject survey on the commission merchant group

Total 72 commission merchants were participated in this survey. The survey on asking the problem of forwarding the chinese cabbage with the net bag was responded as the transportation & storage, the spoilage on unloading, the erosion of the product by contacting the net 66.7%(48pp), the over demanding labor costs 16.7%(12pp), the environmental pollution after using the net 9.7%(7pp), no response 5.5%(4pp). The opinions about lowering merchantable quality was mainly discussed as well as the over demanding labor costs.

&lt;Table 10&gt; The problem of forwarding with net bag

The problem of forwarding with net bag	Number of response	Percent(%)
Erosion & Spoilage	48	66.7
Hygiene & Storage	1	1.4
The over demanding labor costs	12	16.7
the environmental pollution	7	9.7
No response	4	5.5
Total	72	100

The survey on asking the suitable material for palletizing the chinese cabbage was answered as the net bag 73.6%(53pp), waterproof corrugated cardboard box 22.2%(16pp). There was positive recognition for the net bag more than waterproof corrugated cardboard box.

<Table 11> The suitable packing material for palletizing the chinese cabbage

Packing material	Number of response	Percent(%)
Net bag	53	73.6
Waterproof corrugated cardboard box	16	22.2
Folding type plastic box	3	4.2
Multi-stage wooden box	0	0
Total	72	100

#### 4. Analysis for usage of waterproof corrugated cardboard box

Total In the cases of the forwarders and the commission merchants, the net was highly responded as 45%, 74% from each groups for the best packing material for mechanization of distribution and the waterproof corrugated cardboard box was responded as 20%, 22% from each groups as much preferable than multi-stage wooden box.

However, for the radish, the waterproof corrugated cardboard box was the best material as 56%, and the auction trader group supported it for 80%. So, the using the waterproof corrugated cardboard box for mechanization of distribution was negative for the chinese cabbage, but it was positive for the radish.

For surveying the recognition of using the waterproof corrugated cardboard box for forwarding the chines cabbage and the radish, 70 of forwarders and 70 of commission merchants(total 140pp) was surveyed and the result was analyzed excepting the two cases of no response. Also, the auction traders were excluded in this analysis because they are not related with unloading directly.

The average was 2.42, the standard deviation was 1.24. as the <Table 11> suggested, the negative response(about 55%) was prevailing more than positive response(about 23%). It could be analyzed that even there was the positive recognition for using the waterproof corrugated cardboard box for the radish though the preference for low price of net bag in the chinese cabbage forwarding procedure. Still now, it seems that is a burden for using the waterproof corrugated cardboard box with high price.

<Table 12> The opinions for the usage of waterproof corrugated cardboard box

Classification	Number of response	Percent(%)
Very positive	7	5.0
positive	25	17.9
Normal	30	21.4
negative	33	23.6
Very negative	43	30.7
No response	2	1.4
Total	140	100

In the analysis on the recognition differences about using the wa-

terproof corrugated cardboard box for the chinese cabbages and the radish between the forwarders and the commission merchants, generally the negative recognition was prevailing, but the forwarders(2.696) were more positive for using the waterproof corrugated cardboard box than the commission merchants(2.145).

<Table 13> Analysis of the recognition differences for using waterproof corrugated cardboard box

Group Name	The forwarder	The commission merchant
N	69	69
Average	2.696	2.145
Standard deviation	1.004	1.396
F	10.781	
t	2.660	
Significance possibility	0.001	

The result of surveying the paying intention for using the waterproof corrugated cardboard box in future with a certain price is shown in <Table 14>. The commission merchants were excluded in this survey because the purchaser of the waterproof corrugated cardboard box is the forwarders. It responded as under 300 won 57.1%(40pp), more that 300 won ~ under 400 won 20.0%(14pp), more than 400 won ~ under 500 won 10.0%(7pp), more that 500 won ~ less than 600 won 7.2%(5pp), more than 600 won 1.4%(1p), no response 4.3(3pp).

The 87.1%(61pp) of subjects were responded to pay less than 500 won for purchasing the waterproof corrugated cardboard box.

<Table 14> The price for purchasing waterproof corrugated cardboard box

price(won)	Number of response	Percent(%)
under 300 won	40	57.1
300 - 400 won	14	20.0
400 - 500 won	7	10.0
500 - 600 won	5	7.2
more than 600won	1	1.4
No response	3	4.3
Total	70	100

#### IV. Summary and Conclusion

Even the need of mechanization for distribution work by using pallet to get more efficiency for the agricultural wholesale market has been suggested though, it was hard for palletizing the chinese cabbage and the radish because of it's property of shapes and the moist problems with the useful corrugated cardboard box. Thus the waterproof corrugated cardboard box was suggested as a solution for that in this study and the recognition states were surveyed to the actual

user as the forwarders, the auction traders and the commission merchants.

First, the survey on asking the suitable material for palletizing the chinese cabbage was responded from the commission merchants as net bag 73.6%(53pp), the waterproof corrugated cardboard box 22.2%(16pp), from the auction traders as the waterproof corrugated cardboard box 80%(16pp). The forwarders indicated that the high labor costs (58.6%) as the major problem and responded for the suitable packing material as net bag 45.7%(32pp), folding type plastic box 28.6%(20pp), the waterproof corrugated cardboard box 20.0%(14pp). Also for the suitable packing material for palletizing the radish, the waterproof corrugated cardboard box 55.7%(39pp), folding type plastic box 30.0%(21pp), burlap(PP,PE) 11.5%(8pp).

Second, relatively, the negative opinions were prevailing for survey on using the waterproof corrugated cardboard box with average 2.42, it seems that is because of the much higher price of the waterproof corrugated cardboard box than net bag. The forwarders(2.7) had more positive recognition for using the waterproof corrugated cardboard box than the commission merchants(2.15) from the result from analyzing the recognition differences between the groups. Also, for the survey on the paying intention of purchasing the waterproof corrugated cardboard box, the forwarders 77.1%(54pp) suggested that the cost of packing material should be lower than 400 won.

Even the mechanization of distribution system through the palletizing is essential for distribution efficiency in the agricultural product wholesale market though the existing materials for packing as net bag and burlap are making it difficult for palletizing. As a solution for it, the waterproof corrugated cardboard box was suggested though, the distributors had negative recognition on it because of its high cost.

Consequently, the supporting ways for distribution efficiency in the agricultural wholesale market such as the government's financial support, reinforcement for educational marketing activities about the merits from package standardization and mechanization as well as establishing the measures for using step by steps in the future procedure. The various measures for effective packing are should be determined by analyzing the all the possible factors affecting the distribution efficiency in the future agricultural product wholesale market.

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