Study on Influence of Standardization of Agricultural Product Packages on Cost in Hypermarekts

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Abstract

Although dictionary definition of standardization is 'to prevent disordered complexity and to make and use rules for reasonable simplification or unification, from a position of shop-floor operations of distribution, it is directly connected to efficiency, that is 'productivity equals cost savings'. This study analyzed influence of standardization of agricultural product packages in hypermarkets on costs in stakeholders of distribution channel such as suppliers, distribution centers and hypermarkets. The research findings demonstrated that it would influence manufacturing costs of suppliers and improve shop productivity of hypermarkets.

Key Words : agricultural product, Standardization, Package, Cost, Hypermarket

Ⅰ. Introduction

Since 1997, the government realigned standards of agricultural product packages to fit with the standard pallet system and expanded support for packaging. In addition, it organized distribution equipments and facilities to well fit with Unit Load System (ULS), supported purchase costs of such unloading equipments as pallets and forklifts to enable integrated transportation and unloading with products loaded in pallets from local producers to consumers, and decided to give preference to packaged agricultural productsor agro-shipments in pallets through discounted unloading charges in wholesale markets and assigning the best shops and time for auction. This induced producers, manufacturers and distributors of agricultural products such as farmers and local agricultural cooperatives to use standardized plastic containers or pallets. Keeping pace with this environment of distribution and logistics, hypermarkets increasingly adjusted selling stands to standardized sizes of agricultural product packages and sold agricultural products in packages.

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In this paper, I will examine influence of standardization of agricultural product packages on cost savings of suppliers and distributors and hypermarkets from the following viewpoints. First, what factors of manufacturing cost of suppliers influence cost of sales of hypermarkets through standardization of agricultural product packages and how influence of each factor is different? Second, what factors of distribution cost of hypermarkets influence cost of sales of hypermarkets through standardization of agricultural product packages and how influence of each factor is different? Third, what factors of selling and administrative expenses of hypermarkets influence cost of sales of hypermarkets and how influence of each factor is different?

Ⅱ. Concept of Standardization of Agricultural Product Packages and its Present Condition

1. Standardization of Agricultural Product Packages

Standardization is to fix certain criteria for certain purposes by deciding basic measures or limits and grading is to classify and sort merchandises based on standards which have predefined fixed value. Therefore standardization of agricultural products is to grade all the agricultural products by unified criteria on quality, size, package and indication, and to ship and to deal in them in certain package units and sizes. This means that standardization includes standardization of packages and grading of merchandises.

Standardization of packages means technology and its condition that wraps or ties a merchandisewith a proper material or a container to protect its value and condition and to promote sales in the distribution process. Functions of packaging include such commercial functions as maintenance of content's quality, protection or extension of life, improved convenience of logistics, improved commodity value, facilitation of purchase desire, promotion of sales and etc.

This standardization improves operation and price efficiency of agricultural product distribution by making such exchange functions of agricultural products as marketing distribution and physical distribution be reasonably carried out together with distribution finance, risk taking and distribution information function.

Effects of standardization include the followings. First, it enables saving of distribution cost by improving efficiency of distribution. In other words, standardization brings such effects as saving of distribution costs, prevention of distributional loss, improved commodity value in commodity transactions through shortened transaction time and efforts, sample trading, brand selling,

convenience of logistics and mass transactions. Second, standardization improves market competitiveness and price efficiency of a commodity. As standardization clearly defines concept of and classifies a commodity, suitable price per grade shall be formed which reflects commodity value well through accurate market information and easy use of information. And accurate market information and perfect market competition not only reduce unfair trade caused by volume margin and grade margin but reflect consumers' preferences into production process which expands consumers choices and demonstrates effects of increased demand and sales promotion.

<Table 1> below compares characteristics of standardized shipment and bulk shipment,First of all, standardized shipment makes loading/unloading and shipping work at the level of local produces easy and can prevent a falling-off in quality and freshness when loading/unloading and transporting. It makes auction be carried out easily in a wholesale market, establishes fair trade and improves accurateness of distribution information including prices. In addition, it minimizes amount of garbage in a wholesale market and saves distribution cost with easy loading/unloading work. Since standardized shipment requires packaging and grading to be implemented at the local producers, however, it may significantly increase distribution cost at the local producers and packaging cost per unit market price.

<Table 1> Comparison of Standardized Shipment with Bulk Shipment

Category	Advantages	Disadvantages
Standardized Shipment	▶Easiness in loading and shipping at the local produces ▶Easiness in transportation and loading/ unloading and improved loading/ unloading efficiency ▶Easiness in auction in a wholesale market with standardized sizes ▶official price and accurate information ▶Reduced amount of garbage in a wholesale market	▶Increased cost at the local producers by taking too much time and work forces for shipping work ▶Excessive packaging/shipment cost vs. selling price ▶Deteriorated transportation efficiency since loading volume is less vs. bulk shipment ▶Difficult loading/unloading in case of rain
Bulk Shipment	▶Better connectivity between packaging and harvest-shipment work ▶Saving of distribution cost with reduced time and work forces for shipment work ▶Maximum utilization of loading capacity of transportation vehicles ▶Loading/unloading can be done regardless of weather conditions	▶Difficult to examine quality and size ▶Possible fall-off in quality and freshness when loading/unloading and transporting ▶Excessive amount of garbage after going through wholesale markets ▶Difficult to form official price due to uneven quality, deteriorated fair trade

Source: Huh & Cho (1995), 6-10.

Compared to this, in case of bulk shipment, shipment can be made simultaneously with harvest and work forces and cost for shipment work are required less than in case of standardized shipment. And bulk shipment can utilize loading capacity of transportation vehicles at the maximum and carry out loading and unloading work regardless of weather conditions. However it is difficult to examine grade and size of a commodity and quality or freshness may be deteriorate while loading/unloading or transporting. In addition, it is difficult to form official price based on quality and to establish fair trade since grading is not yet implemented. And it will increase various distribution costs due to re-sorting and packaging in wholesale stage and cause excessive amount of garbage after wholesale stage. Contents of agricultural product standardization project are shown in <Table 2> below.

<Table 2> Contents of Agricultural Product Standardization Project

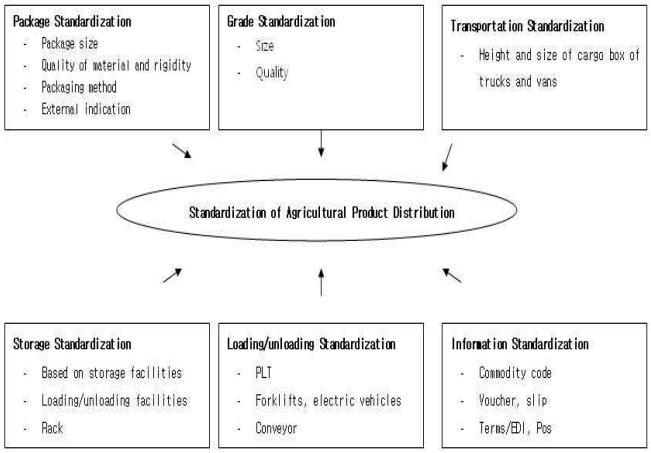
Period	Features	Major Contents
1960s or before	Bulk trading stage	▶Packaging trade for grains or conventional trade in bulk
1970s	Initial packaging trading stage	▶Trade in boxes for a part of fruits and vegetables without package standards ▶Agricultural Cooperative and agricultural product Inspection Center attempted to establish unified standards for trading units
1980s	Establishment of standard trading unit / Development stage of standardization	▶Agricultural Cooperative established standard shipment sizes for 23 items ▶Government established standard trading units for wholesale stage and standards for packaging materials ▶Agricultural Cooperative established its own shipment standards and agricultural product shipment standard for 23 items based on government's standard trading units
1990s	Establishment of standard shipment size / Commencement of standardization project / Systemization of standardization project	▶Management of shipment standard was transferred from Agricultural Cooperative to agricultural product Inspection Center ▶Enacted 'law on promotion of agricultural and marine product processing industry and quality control' ▶Designated agricultural product Inspection Center as the exclusive distribution management institute in charge of standardization project ▶Prepared a plan to promote distribution management of standardized agricultural products

Source: Huh & Cho (1995), 40.

2. Distribution Standardization

Standardization of agricultural products should be made within the frame of standardization of distribution since standardization of packages is meaningless unless distribution facilities or equipments are standardized. Distribution efficiency can be maximized by package standardization only when integrated transportation system is established through inter-connectivity and compatibility of various distribution facilities and equipments.

Standardization of distribution is to simplify, to standardize and to specialize distribution system. Contents of standardization are shown in < Figure 1> below



<Figure 1> Contents of Distribution Standardization

.Distribution standardization refers to standardize facilities, equipments, materials and terms used in each stage of distribution such as transportation, storage, loading/unloading, packaging, information and etc. and to improve efficiency of distribution activities through connectivity and compatibility. Out of objects of distribution standardization which include packaging, grading, transportation, storage, loading/unloading and information, packaging and grading are unique objects of standardization of agricultural area and transportation, storage, loading/unloading and information are those that accept national standards. <Table 3> shows items on which shipment standards are established.

<Table 3> Major Items with Shipment Standards Established

Category	Items
Fruits	apple, pear, sweet persimmon, persimmon (ripe persimmon), dried persimmon, astringent persimmon, citrus, peach, plum, grape, chestnut, pineapple, Siberian gooseberry, citron, dried jujube, fresh jujube, Japanese apricot, western cherry, apricot, hulled pine nuts, walnut, ginkgo nut, cherry, fig (24 items)
Garden fruits	dried red chilli, green chilli, Quarri green chilli, fresh red chilli, cucumber, green pumpkin, eggplant, tomato, cherry tomato, oriental melon, strawberry, watermelon, Jorong watermelon, melon, bell pepper, green corn, unripe bean (18 items)
Other vegetables	Onion, garlic, stem of garlic, greenonion, radish, Chinese cabbage, winter-grown Chinese cabbage, cabbage, carrot, spinach, lettuce, sesame leaf, chives, yam, ginger plant, lotus root, burdock, crown daisy, stem of sweet potato, water parsley, celery, red cabbage, broccoli, kale, cauliflower, parsley, deodeok, dried Chuinamul (28 items)
Root and tuber crops	potato, sweet potato (2 items)
Mushrooms	oyster mushroom, button mushroom, dried pyogo mushroom, fresh pyogo mushroom (4 items)
Flowers	chrysanthemum, carnation, rose, lily, gladiolus (5 items)
Total	Total 6 categories and 81 items

Source: Huh & Cho (1995), 35.

Problems of standardization are largely divided into those of packaging standardization and grading at the local producers and those of standardization-related policies. Problems and issues of packaging standardization of agricultural products at the local producers include standard trading unit, packaging material, design, trademark, unit packaging weight and excessive packaging. First, trading proportion in standard trading units differs significantly by item or category. In general, fruits and some vegetables grown in facilities have higher trading proportion in standard trading units whereas normal vegetables have much lower proportion. <Table 4> shows distribution in standard trading units of major agricultural products.

<Table 4> Distribution in Standard Trading Units of Major Agricultural Products

Category	Item (Proportion)
1. Items in settlement stage (23 items with 70% or more)	bell pepper(99.6)citrus(99.0)sweet potato(98.9) pear(98.6)cucumber(98.6)potato(98.5) sesame leaf(98.4)green chilli(98.2)lettuce(96.7) plum(96.1)sweet persimmon(95.7)pineapploe(95.0) peach(94.6)tomato(94.3)persimmon(92.9) mushroo(92.5)oriental melon(91.5)eggplant(90.5) pumpkin(87.4)apple(85.8)carrot(82.2) kiwifruit(82.2)onion(73.9)
2. Items in intermediate stage (4 items with 30~70%)	grape(65.9)spinach(61.3)melon(41.8) garlic(38.1)
3. Sluggish items (8 items with 30% or less)	chestnut(29.7)strawberry(29.2)cabbage(18.9) radish(8.6)dried red chilli(4.1)watermelon(1.7) Chinese cabbage(0.3)green onion(0.1)

Source: Huh & Cho (1995), 41.

If we look at present conditions of standardization of major agricultural products by distribution stage, those items with higher trading proportion in standard trading units such as apple, pear, sweet

persimmon, onion, oriental melon, cucumber and etc. are packaged in standard trading units by farmers and agricultural cooperatives but such vegetables as chilli, garlic and green onion are still traded in conventional trading units. That is, those items with relatively high market prices per unit generally have high proportion of standardized shipment at the local producers and those items with low market prices have low proportion.

Second, although various materials are used for packaging, the post popular packaging material in most of items turned out to be corrugated cardboard box. However there are big differences in packaging materials, indication, rigidity and design based on who the shipper is. In particular, package design should take into account convenience in transportation, storage and loading/unloading, easiness in collection and recycling, elegance of outward appearance and facilitation of purchase desire, and especially make external indication be made clearly. However refinement of design is relatively inferior and rigidity of packaging is very uneven based on shipper or shipping organization which implies that standardization of packaging materials and rigidity not implemented properly.

Third, trademark and brand have functions of differentiation and distinguishment of a commodity, indication of a producer, credibility of a commodity and quality assurance, and for commodities with trademarks, brand selling, sale by subscription and sample trading are available. Purpose of producer's trademark is to improve competitiveness together with increase of demand, advertising effect and commodity protection effect by securing markets and by expanding consumer base through differentiation of commodities. In case of fruits and vegetables, however, trademarks or brands are not earnestly introduced except indicating place of production and name of producer and therefore differentiation of commodities by packaging is not implemented.

The biggest reason why a middleman or shipper take quality margin or volume margin in distribution and unfair trade prevails is that standardization and branding of commodities was not made. Therefore standardization and branding of fruits and vegetables are very important in a sense that producers can acquire credibility of consumers on their products and secure the market as well as it can be used as a means to expand the market through differentiation of commodities and advertisement. Present conditions of standardization of major agricultural products by distribution stage are shown in <Table 5>.

<Table 5> Present Conditions of Standardization of Major Agricultural Products by Distribution Stage

Category	Producers	Agricultural Cooperatives at Place of Production	Dealers	Wholesalers	Retailers
Chilli	gunnysack for 100 Geun	Packaging by 3kg after sorting	repackaging by 100 Geun	repackaging by 100 Geun	sale by Geun, vinyl packaging by Kg
Garlic	net sack for 20kg, cold season type (100 pieces, 50 pieces)	corrugated cardboard for 30kg, bundle of a hundred bulbs	net sack for 20kg, wooden box for 18kg, plastic for 27kg	net sack for 10 and 20kg, cold season type (100 pieces, 50 pieces)	bundles of 50and 100 bulbs, by Jeob (hundred bulbs), 500g/1kg
Onion	net sack for 20kg	net sack for 20kg	net sacks for 5, 8, 10, 15 and 20kg	net sacks for 2, 3, 5, 8, 10, 15 and 20kg	net sacks for 2, 3 and10kg
Green Onion	vegetable garden sale	corrugated cardboard for 15kg,	bundle in straw by 10kg, PE container	by truck	by Dan or by piece
Apple	corrugated cardboard for 15kg, wooden box for 20kg, lump sum purchase at fields			corrugated cardboard for 15kg	by box or by piece
Pear	corrugated cardboard for 15kg			corrugated cardboard for 10kg and 15kg	by box or by piece
Sweet Persimmon	packaging of 5 pieces and corrugated cardboard for 15kg		Pre-harvest sale, sale by 15kg	corrugated cardboard for 15kg	vinyl packaging by 5 pieces
Watermelon	outdoors: by piece indoors: corrugated cardboard			corrugated cardboard box for 3 pieces	sale by piece
Oriental Melon	corrugated cardboard for 15kg				sale by piece
Cucumber	outdoors: PE container indoors: corrugated cardboard for 20kg				sale by piece or by amount
Tomato	corrugated cardboard for 15kg				by Kg or Gwan
Strawberry	Styrofoam for 1kg, paper box for 2kg, Styrofoam for 8kg				sale by Geun(400g) or kg

Source: Huh & Cho (1995), 43.

Ⅲ. Influence of Standardization of Agricultural Product Packages on Cost

1. Definition of Cost

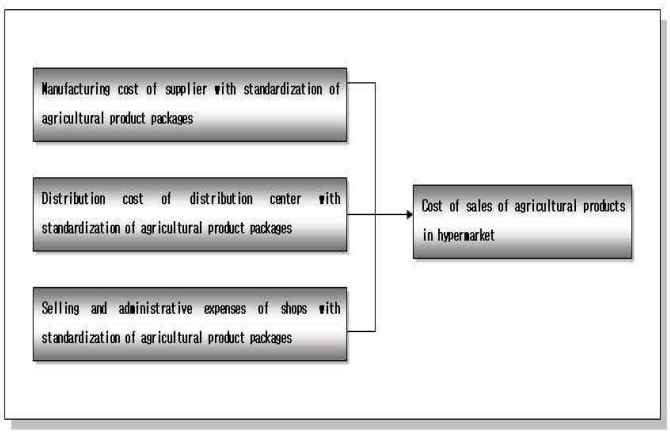
Definitions of manufacturing cost, distribution cost and cost of sale in hypermarkets are as follows. Manufacturing cost of suppliers refers to sum of costs of goods or services used to supply products. It consists of direct material cost, direct labor cost and indirect manufacturing costs (indirect material cost, indirect labor cost and other indirect cost). Since this study is limited to agricultural products, it does not include direct material cost but refers to man hour productivity (direct labor cost) used in packaging work, distribution cost (indirect cost) to supply commodities and material cost (indirect material cost) arisen due to difference in packages for commodity supply.

Distribution cost (for distribution center of hypermarket) refers to sum of costs of goods or services used to deliver products to shops. It consists of direct delivery cost, labor cost and operational expenses. Since this study islimited to agricultural products, operation expenses are assumed to be same and therefore it only includes direct delivery cost to deliver products, and man hour productivity (labor cost) needed to purchase, move and transport products which were supplied.

Cost of sale in hypermarkets refers to gross expenditure used for purchase and sale of commodities, that is sum of purchase cost and selling cost. In this study, it means costs used to purchase commodities from suppliers, distribution cost to deliver those commodities to shops and costs used to move and display commodities in each shop.

2. Research Design and Model on Degree of Influence

In this study, we designed the research as shown in < Figure 2> to examine what factors of standardization of agricultural product packages influence costs of suppliers, distribution centers and shops, and how such factors are different in terms of level of influence.



< Figure 2> Research Design and Model

Whereas manufacturing cost of supplier with standardization of agricultural product packages consists of direct material cost, direct labor cost and indirect manufacturing costs (indirect material cost, indirect labor cost and other indirect cost), direct material cost in this study is limited to cost needed for standardization of packages except commodities since this study is limited to agricultural products, and we considered direct labor cost as man hour productivity used for packaging work, and indirect cost as delivery cost to supply commodities.

We measured them by 11 questions in total with 2-3 questions for each factor. We used mean value, which was calculated by summing each question and dividing it with number of the questions, as the index of influence of standardization of agricultural product packages on manufacturing cost and the higher score means the more influence on cost.

Distribution cost of distribution center with standardization of agricultural product packages is mixed invarious accounts in most cases. Therefore total distributioncost can not be identified correctly without sorting this out. In this study, we considered direct delivery cost to deliver products to shops and man hour productivity used to classify and move products as direct labor cost, and things related to product loss and freshness as commodity value. We measured them by 7 questions in total with 2-3 questions for each factor. We used mean value, which was calculated by summing each question and dividing it with number of the questions, as the index of influence of standardization of agricultural product packages on manufacturing cost and the higher score means the more influence on cost.

To measure influence of selling and administrative expenses of shops with standardization of agricultural product packages on cost of sale of a shop, we divided measuring factors into labor cost, commodity value and commodity competitiveness. We measured them by 7 questions in total with 2-3 questions for each factor. We used mean value, which was calculated by summing each questionand dividing it with number of the questions, as the index of influence of standardization of agricultural product packages on manufacturing cost and the higher score means the more influence on cost.

3. Subjects and Tools of Influence Research

In this study we used questionnaires to collect data for empirical analysis. The questionnaire is in report form and takes around 10-15 minutes to reply. It largely consists of four parts; influence of standardization of agricultural product packages on manufacturing cost of supplier, that of standardization of agricultural product packages on distribution cost of hypermarket, that of standardization of agricultural product packages on selling and administrative expenses of shops,and that of standardization of agricultural product packages on cost of sales of agricultural products. Respondents of the questionnaire include suppliers, staff in distribution center and sales clerks of A hypermarket and the questionnaire consists of 33 questions. For more details, please refer to <Table 6> below.

<Table6> Composition of Questionnaire

Sub-factors	Number of Questions
Cost of Sales of Hypermarket through Manufacturing Cost, Distribution Cost and Selling and Administrative Cost	8
Manufacturing cost of supplier with standardization of agricultural product packages	11
Total	33

4. Research and Analysis Results

We analysed 21 copies of questionnaires from 21 suppliers, 35 copies from staff of distribution center of A hypermarket and 210 copies from sales clerks working for shops of A hypermarket. Results of questionnaire analysis are as follows.

First, in case of suppliers, responding rate of 'saving of package cost' through use of standard packages was the highest (59% of total) and 'prevention of product damage' followed the next (35% of total). On the contrary, respondents replied with 'neutral' or 'disagree' for the rest of questions. Replies from suppliers are summarized in <Table 7> below.

<Table 7> Summary of Replies from Suppliers

NO	Questions to Suppliers on Standardization of Agricultural Product Packages	Absolutely Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Standardization of packages has reduced material cost.	○				
2	Standardization of packages influencesproduct cost the most.					○
3	Standardization of packages has reduced package destruction.				○	
4	Standardization of packages has shortened working hours.			○		
5	Standardization of packages has reduced waiting time for acceptance by hypermarket when delivering commodities.			○		
6	Standardization of packages has shortened product transportation time.			○		
7	Standardization of packages has better used loading capacity when delivering.			○		
8	Standardization of packages has reduced number of vehicles to transport.			○		
9	Standardization of packages has reduced commodity loading/unloading time.				○	
10	Standardization of packages needs to be expanded.				○	
11	Standardization of packages will affect price competitiveness positively.			○		

Second, replies from distribution center showed the highest rate for 'function of prevention of commodity damage and protection' with 48% whereas cost saving factors were replied with 'neutral' or 'disagree'. Replies from distribution center are summarized in <Table 8> below.

<Table 8> Summary of Replies from Distribution Center

NO	Questions to Distribution Centeron Standardization of Agricultural Product Packages	Absolutely Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Standardization of packages has reduced wrong delivery to other shops.		○			
2	Standardization of packages has enables use of equipments (forklift and hand jockey) and reduced working hours.			○		
3	Standardization of packages has reduced working hours through automated acceptance.			○		
4	Standardization of packages has improved coherence of logistics equipments (cart and pallets).			○		
5	Standardization of packages has enabled more volume to be loaded in logistics equipments (cart and pallets) than before.			○		
6	Standardization of packages has reduced destruction of products. (destruction of packages or commodities)				○	
7	Standardization of packages has maintained freshness of commodities well.			○		

Third, replies from the hypermarket showed the highest rate for 'shortened time for product display and movement' with 68% of total and 'reduction of product destruction and maintenance of freshness' had relatively responding rates. Replies from the hypermarket are summarized in <Table 9> below.

<Table 9> Summary of Replies from the Hypermarket

NO	Questions to Hypermarket on Standardization of Agricultural Product Packages	Absolutely Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Standardization of packages has drawn better customer reactions.			○		
2	Standardization of packages has drawn better employee reactions.			○		
3	Standardization of packages has improved competitiveness of commodities.			○		
4	Standardization of packages has shortened time for moving commodities.					○
5	Standardization of packages has shortened time for displaying commodities.					○
6	Standardization of packages has reduced destruction of products.				○	
7	Standardization of packages helps to maintain freshness of commodities as refrigerators can be used.				○	

IV. Conclusion

Findings of this study suggested the followings. First, standardization of agricultural product packages in hypermarkets reduced cost of products of suppliers. Second, it improved man hour productivity through easy display and movement within a shop and saved cost of hypermarkets. However cost saving effect in the distribution center was less visible since numerous suppliers used the distribution center and therefore standardized packages and unstandardized packages were mixed.

However this study is meaningful in a sense that it disclosed that standardization of agricultural product packages would enhance benefits of consumers who use hypermarkets. That is, standardization of agricultural product packages helps suppliers to provide better commodities to hypermarkets at lower prices through savings in manufacturing cost and hypermarkets to sell commodities at lower prices through savings in selling expenses.

Lastly, this study adopted questionnaires for a tool of research and analysis and therefore could identify influence of standardization of agricultural product packages on cost only qualitatively by 'yes' or 'no'. Therefore subsequent studies need to design quantitative research model and to measure degree of its influence on cost numerically.

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