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PACKAGING SECTOR ACTION PLAN

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ACRONYMS

AIC – Azerbaijan Investment Company

BDS - Business Development Services

CIIC – Caspian International Investment Company

CF – Common Footprint

ECT – Edge Crush Test

FAO – Food and Agriculture Organization (under the UN system)

FEFCO – European Federation of Corrugated Board Manufacturers (French acronym)

IoPG – Institute of Packaging, Ghana

IoPP – Institute of Packaging Professionals (US-based)

ISO - International Standards Organization

LDPE - Low density PE

OPP - Oriented polypropylene

PE - Polyethylene

PET - Polyester or more accurately, Polyethylene teraphthlate

PS – Polystyrene

PSCEP – Private Sector Competitiveness Enhancement Program

PVC – Poly Vinyl-chloride

SIC – Standard Industry Classification

SME - Small to Medium sized enterprises (companies)

WPO – World Packaging Organization

TERMINOLOGY

Convertor – a packaging company which converts packaging materials into a more usable form for users. Operations for film convertors are to laminate, print, and slit films for use. For corrugated and box makers, they print, slit and score and die-cut sheets of corrugated board into box form.

Corrugated fiberboard – a paperboard construction consisting of liner boards separated by a paperboard fluted-medium

Die-cut – Cutting corrugated board in a specific pattern, e.g.: to allow holes for produce to breath and cuts to allow the board to be made into a tray or box. This is done in combination with scoring (see below).

Double wall corrugated – a corrugated construction consisting of three liners separated by two fluted mediums. This may also be called 5-ply or "5 lines."

Grammage – the basis weight of liner board (the outside paperboard surfaces of corrugated) expressed in most parts of the world as g/m^2 and in the USA as lbs/1000 ft^2.

Preform – an injection molded tube that is heated and blown in another machine to make a PET bottle.

Single wall corrugated – a corrugated construction consisting of two liners separated by a fluted medium. This may also be called 3-ply or "3 lines."

Score – Depress corrugated in a line to facilitate bending to make a tray or box.

Slitter – Cutting board or film to a desired width.

SECTION I: EXECUTIVE SUMMARY

A. Overview and Sector Analyses

Packaging contains, protects, provides information, and serves as a marketing tool for a product. Small to medium sized enterprises (SMEs) in Azerbaijan and most developing countries often consider packaging only as a necessary cost item that must be minimized. Packaging therefore satisfies the obvious requirement to contain the product with some protection, but often ignores or minimizes the marketing function. As a result, minimally packaged products compete poorly against products offering a better presentation to the consumer.

To further illustrate this point, packaging costs per capita in the developed world are considerably higher than those in the developing world. Packaging from developed countries offers better protection, longer distribution chains and considerable branding and marketing. Packaging also protects food products with a means to increase shelf life and provide more distribution time; in correlation, in countries with higher rates of per capita hunger there are lower per capita packaging costs. These points are discussed in more detail in the main body of the report.

Packaging for agricultural products is typically corrugated shippers, wood or plastic crates.[1] Other components include labeling and pulp or foam separators for produce. Food products also employ glass, metal, plastic and other paperboard containers.

Corrugated shippers are the largest packaging component for agricultural products.
Total capacity in Azerbaijan for corrugated boxes used for agricultural produce is estimated at 20 million containers per year. Corrugated production in Azerbaijan is currently approximately 60% of capacity for shippers with 12 million containers per year.

A significant observation of Azerbaijani shippers is that there is no way for a user to know the construction of a specific shipper unless it is obtained from the manufacturer. While some of the corrugated is made to recognized standards, most is not. In Azerbaijan, there is a lack of standards, along with lack of guidelines to match standards for performance requirements, which results in a considerable loss of business to imported corrugated containers. Designation of packaging specifications and standards are therefore included in the Action Plan.

Production of Azerbaijani-made wood crates for agricultural use in Guba and Ganja regions is estimated to be 12 million per year. Wood crates are perceived in Russia and CIS countries to contain higher quality Azerbaijani produce, rather than lower quality produce from Iran or Turkey which is received in corrugated shippers. As a result, wood crates are used, even though they are more expensive and heavier than corrugated containers. Wood also has the advantage of use in cold storage where corrugated becomes weakened by humidity. Countering these advantages, however, is the recent wood ban in Azerbaijan which precludes using forest products for new production.

[1] See previous page for a listing of packaging terminology.

While plastic crates – both in lighter form for export and heavier form for in-house use by growers – are also used for agricultural produce, their production is limited in Azerbaijan.

Annual agricultural yields in Azerbaijan are is estimated to be 834,200 metric tons of fruits and vegetables – 485,725 tons for domestic use and 351,475 tons for export. The estimated distribution of agricultural products in the three major packaging systems is presented in the following table:

Table 1: Estimated Distribution Modes of Azerbaijani Produce

Product	No. Boxes Corrugated	No. Wood Crates	No. Plastic Crates
Total Fruit	13,013,813	7,210,688	
Total Vegetable	2,711,332	3,446,281	2,069,951
Total Fruit & Vegetable	15,725,145	10,656,969	2,069,951
Total Juice	3,390,792		
Total Ag Packaging	19,115,937	10,656,969	2,069,951

For processed food products, other packaging materials are used. Glass has experienced growth in Azerbaijan. Three years ago, 95% of the glass used in Azerbaijan was imported, primarily from Georgia. Now 95% of the glass used is local production. Metal can production is available in Azerbaijan, but no facilities exist to make easy open closures. Other packaging materials include paper and paperboard, as well as flexible structures.

B. Assessment and Analysis

The value chain for fresh produce from farm to market is discussed in section IIIA, followed by graphic depictions of value chains for corrugated shippers, wood crates and plastic crates. The section concludes with an agricultural value chain for packaging in Azerbaijan, both today and in the future.

An important component of the industry assessment relates to a common description of local packaging by consumers as "poor quality" – the reason they cite for preferring to use imported packaging. This "poor quality," however, appears to be more representative of poor (inappropriate) specifications for the packaging, rather than poor manufacturing of the packaging materials themselves. The Azerbaijani packaging industry, particularly corrugated, experiences major losses in market share to imports because of a difficulty in characterizing packaging and matching appropriate packaging to specific applications.

Constraints to the Azerbaijani packaging industry include:

- Strong competition from and availability of high quality, reasonably priced packaging materials from Iran and Turkey;
- Inability of local markets to accept and/or upgrade to new packaging systems because of cost;
- Companies are reluctant to invest in new packaging because of costs and the perception that consumers prefer unwashed, poorly packaged agricultural goods because they imply that the products are "organic" and "fresh", etc.;
- Small local market size leads to small packaging orders, which discourages investment and modernization, and precludes taking advantage of economies of scale;
- The industry has no association or unified voice to project the contribution of packaging to the economy;
- The lack of consistent construction or specifications;
- There is a lack of vital data on the packaging industry and consumption patterns;
- Facilities for packaging design, testing and education are lacking; and
- Low or inadequate technology and skills in packaging.

C. Packaging Sub-Sector Action Plan

Through its Domestic Resource Costs (DRC) analysis, PSCEP has indentified packaging as a weak segment in the value chain of many agricultural products. Accordingly, the program intends to address packaging constraints in an effort to provide sub-sector and value chain impact. This Action Plan includes interventions to build packaging production capacity at a firm-level, as well as actions aimed to increase the overall competitiveness of the Azerbaijani packaging industry and the value chains which it supports.

Competitiveness can be built with packaging specification, guidelines to match packaging specifications to product performance, building cross-industry capabilities including an Azerbaijani logo for exports, and enhancing packaging education at universities and through industry seminars. Central to specifications and cross industry programs is the formation of a packaging industry associations or institute. The plan concludes with profitable means to dispose of packaging waste. The programs are summarized below:

C1. Firm-level Support: Technical Assistance and Access to Finance

Sector competitiveness can only be achieved through the competitiveness of its individual enterprises. PSCEP should assist progressive sector firms in improving standards, qualities, lowering costs, and in access to finance. Enterprise level support will depend on discussions with enterprises, negotiation Competitiveness Plans through PSCEP's business deliver service (BDS) providers. Enterprises will also change during the course of the project. Assistance to individual companies should be further analyzed to ensure a meaningful invest-return ratio and, in particular, impact at the sub-sector/value chain level through assistance to these enterprises. At this time, the initial focus of PSCEP's actions will be on those companies listed below. They are important regional packaging suppliers to agribusinesses in their areas. Quality improvements of their products should have a meaningful impact on the value chains that they serve.

a. <u>Support to Corrugated Sector</u>
   i. Safari – Increase corrugated box output and competitiveness

ii. AIC Investment in Azersun in recycled board plant
iii. NAA Company – corrugated producer, also serving cold chain and greenhouse sectors

b. Support to Wood Crate Sector
i. Abudullah Abdullayev – Development of fiberboard facility to utilize of wood waste

c. Support Plastics Sector
i. SAF Plastics – Develop PVC stretch film line
ii. Azer Pak – Add Thermoform line
iii. Azer Pak – Upgrade to 8-color film printing line

d. Other Investment Opportunities
i. AIC investment in glass bottle manufacturer

C2. Association Building: Develop an Azerbaijani packaging association or institute to enhance packing sector competitiveness

Voluntary cooperation of competing companies, especially in a segmented system in which various components of the value chain optimize their position without viewing the whole chain (such as choose cheap packaging materials that do not prevent damage further up the value chain), is essential. Associations or packaging institutes world-wide serve as important institutions to improve standards and enhance competitiveness in the packaging segment of many value chains. Specific advantages provided by a packaging association in Azerbaijan are as follows:

- Set voluntary standards that reduce product damage for users and allow suppliers to compete more effectively with foreign imports;
- Design a logo that defines/identifies Azerbaijani produce;
- Provide a forum to discuss and demonstrate marketing capabilities of packaging;
- Provide a forum to share packaging knowledge with the outside world; and
- Provide a forum to bring in outside experts for the benefit of the industry and offer seminars.

PSCEP will work actively with sector enterprises and stakeholders to develop a step by step process of associative initiatives, leading the establishment of a sector association or institute.

C3. Sector-level Support: Building Competitiveness

PSECEP will provide the following assistance:
i. Brand Azerbaijani produce
ii. Determine specifications and standards for Azerbaijani corrugated
iii. Reduce damage of produce transported in corrugated
iv. Waste management
- Exporting waste
- Briquette line

D. Expected Results and Impact

Table 2 quantifies the direct impact of Action Plan activities. It does not take into account the likely more significant impact of sub-sector actions, i.e., impact on more competitive agricultural products, improving the Azerbaijan "brand," etc. Yet it is these indirect impacts that will make the greatest contribution to Azerbaijan's agri-business competitiveness. For example, the aggregate contribution to direct and indirect employment from Action Plan activities will be many multiples beyond those highlighted here.

Table 2: Action Plan Interventions and Expected Results

Action	Section	Investment	Initiation	Time frame	Sales Increase	Jobs created
Safari enhancement	A1a	90,000 AZN	Upon investment	6 months	1,600,000 AZN	30
Azersun - Papermaking plant	A1bi	17,337,000 AZN	Upon investment	24 months	9,654,000 AZN	250
NAA Company Corrugated plant in Ganja	A1bii	4,100,000 AZN	Upon investment	12 months	2,112,000 AZN	14
Abdullah Abdullayev - Fiberboard line	A2a	800,000 AZN	Initiate ASAP	12 months	756,000 AZN	75
SAF Plastic - Purchase a PVC line	A3a	300,000 AZN	4 months	3 months	200,000 AZN	10 estimated
Azer Pak - Thermoform line	A3b	1,100,00 AZN	Upon investment	4 months	88,000 AZN	4 estimated
Azer Pak - Printer line	A3c	550,000 AZN	Upon investment	4 months	345,600 AZN	4 estimated
Initiate a Packaging Institute	B	Mostly volunteer + funds proportional to activity	ASAP	18 months	Quality, trained people. Sector competitiveness	Improved skills. Facilitate C2 and C3
Logo design for corrugated	C1		Packaging institute	24 months		
Boxmakers certification designation	C2		Packaging institute	24 months		
Match packaging to performance	C3		Packaging institute	24 months		
Corrugated collection	C4a	100,000 AZN	Upon investment	4 months	800,000 AZN	2
Briquette line	C4b	145,600 AZN	Upon investment	5 months	150,000 AZN	3
TOTALS		**24,522,600 AZN**			**15,705,600 AZN**	**410**

SECTION II: SECTORAL OVERVIEW

The packaging industry, in its broad definition, serves virtually all products in Azerbaijan and any other country. Packaging includes:

Primary packaging: packaging that is in direct contact with the product.
Secondary packaging: packaging for the product but that is not in direct contact with the product such as a carton in which a bag of cereal is contained.
Transportation packaging: packaging used to transport products including shipping containers and pallets.

Some packaging components serve multiple functions. For example, a shipper (wood or corrugated) used for agricultural produce is both primary and transportation packaging.

This report concentrates primarily on agricultural packaging. The sector analyses below therefore include an analysis of packaging and agricultural products.

A. Packaging Sector Analysis

Unlike many other industries, packaging does not have its own Standard Industrial Classification (SIC). It consists of portions of many industries including glass, wood (mostly hard wood), metal (steel and aluminum), plastic and machinery. As an industry, packaging is one of the largest, being a component of virtually any product which is brought to market.

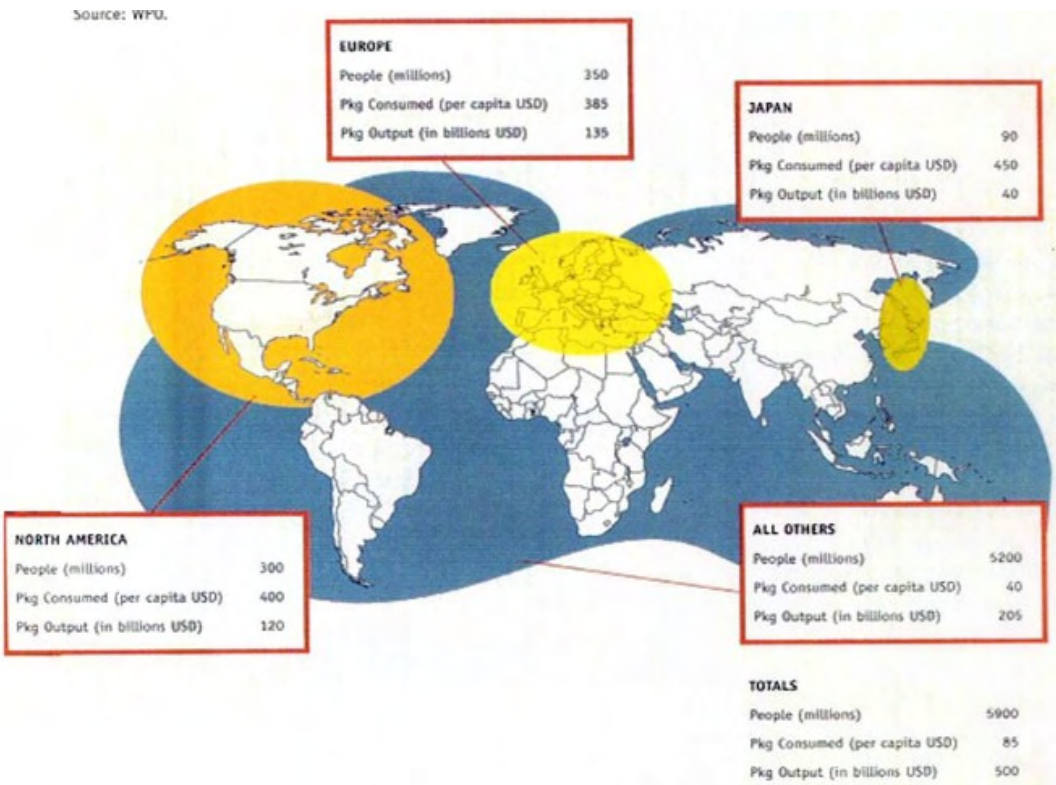
The attitude concerning packaging is a key difference between the developed and developing economies. Internet access allows any country to obtain any packaging material available on the international market. But access is not sufficient. SMEs in developing counties (as well as many in developed countries) often consider packaging only as a necessary cost item and attempt to utilize the cheapest packaging available. This packaging may adequately protect a product, but not present it well to consumers. A good product that is poorly packaged competes poorly against better packaged products in a market driven society. The package, after all, is the sole introduction of a new product to the consumer. Product quality can only be ascertained after the first purchase, and while quality could drive future sales, it will not facilitate the initial purchase unless that quality is conveyed through outside sources (e.g. advertising, personal endorsements). Therefore the package serves as the presentation vehicle for the product.

The marketing function of packaging is difficult to convey to companies for whom packaging is only an afterthought, or a cost item to be minimized. This problem is further exacerbated by distribution practices in planned or transition economies where products are or were traditionally presented in non-differentiated form. Peas, for example, may be canned or frozen without any separation of quality, such that every can of peas is essentially the same. In a system with no choice and limited supply, this product is purchased. However, in a system where this product must compete with differentiated products (less expensive small peas, more expensive premium peas), the product will fare poorly (and be designated as poor quality).

Attitude concerning packaging, both differentiating what gets packaged and the package choice, therefore, defines how well the product will compete in the marketplace. This discussion relates directly to the packaging materials manufactured in Azerbaijan. The demand and production, at least in the SME sector tend to be minimally acceptable at lowest cost. Higher quality packaging is available through larger producers in Azerbaijan and through imports, and used by more competitive companies. While, companies that have a steady market, such as agricultural products in which demand exceeds supply, have no difficulty with minimum packaging; expansion into new markets, however, will require a more competitive packaging choices.

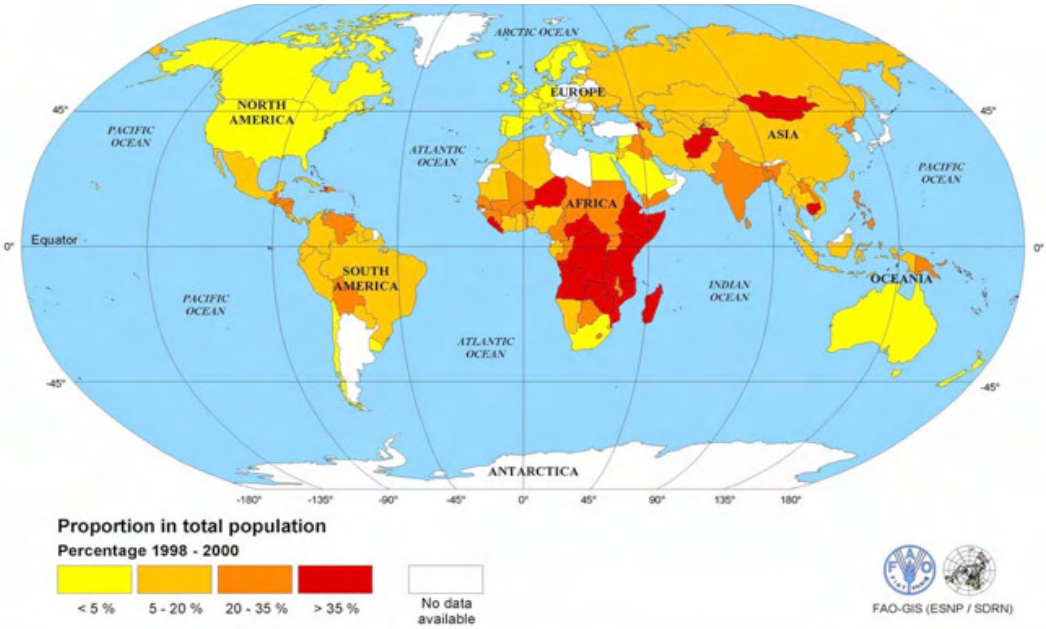
The principles described above are supported by studies of per capita packaging expense versus economic development. The World Packaging Organization (WPO) completed such a study which is graphically presented below:

Figure 1: Populations, estimated per capita packaging consumption and total packaging output



The conclusion of this study is that developed countries spend more on packaging than less developed countries. This observation alone does not demonstrate the full importance of packaging in economic development. However, relating packaging to world hunger offers an additional perspective. The following World Hunger Map was developed by the Food and Agriculture Organization of the United Nations (FAO).

Figure 2: Map of World Hunger
Proportion of undernourished people (1998-2000)



It is not coincidental that countries with higher per capita packaging costs also have lower hunger. Packaging protects food, and better packaging preserves food that is already produced, thereby extending the shelf-life and affording additional time for storage and sales.

Summarizing the two figures above offers the following:

Table 3: Slightly Oversimplified World

World	First	Second	Third
Economy	Developed	Developing	Under Developed
Packaging	Over	Under	Almost None
Food Available	Plentiful	Marginal to Adequate	Inadequate
Food Losses	Acceptable	Troublesome	Unacceptable

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Translating the above information to the Azerbaijani context: competitiveness may be substituted for packaging. In this case, products are not necessarily under-packaged from the protection standpoint (though often are), but from the competitiveness perspective. In the interviews with users of corrugated shipping crates in the agricultural sector, multiple users reported purchasing Iranian and Turkish corrugated containers because the Azerbaijani containers were *under-*

packaged, i.e. they failed to perform adequately for stacking, protecting produce, and applicability to cold storage.

Part of the reason Azerbaijani packaging competes poorly with imported packaging, in many cases, relates to constructions that are inadequate for the task. In Azerbaijan, packaging materials are not made to any specifications, and the lack of specifications limits the choice, and knowledge that the packaging will perform adequately. Whereas, imports are constructed to standards that relate to performance, and thereby assure applicability for the chosen task.

This brings up an important recommendation that will be presented in the action plan relating to the need to establish packaging standards in Azerbaijan. Standards are beneficial to both packaging suppliers and packaging users because it allows both to better match requirements to function. Standards therefore facilitate sales and market extension by increasing competitiveness. For companies that plan to increase exports, especially those expanding into Europe and possibly the US, such standards become necessary to for access to those markets.

Below is a brief introduction of various packaging materials. While the emphasis will be on packaging uses for agricultural products, uses extend to virtually every product. The different packaging sectors are described below, with an emphasis in those factors which define material choices and competitiveness indicators for expanded trade, both in-country and for export.

A1. Packaging Materials

A1a. Corrugated

Corrugated (often called simply cardboard) consists of paperboard liners separated by a fluted medium. Liners are typically made of kraft paper, (kraft meaning “strong,” resulting from long cellulose fibers - which are not smashed, as is the case with paper, to make a smoother surface). It is also manufactured in various flutes that are designed for different purposes: A-flute (widest) offers the greatest impact resistance, B-flute (tighter flute and thinner wall) offers good stacking strength, C-flute offers a reasonable compromise between impact and stacking strength and wall thickness, and E and F flutes (very thin) are used for specialty applications such as primary packaging for cosmetics and pharmaceuticals. In addition to the flutes, corrugated liners come in different basis weights (weight per unit area). Higher liner weights provide additional strength, both in terms of impact and stacking.

Corrugated can be manufactured with similar liners on both sides, different basis weight liners on different sides, and different liner formats, such as bleached kraft which offers a white surface denoting cleanliness and providing a favorable printing surface. Corrugated board can be coated or waxed to add additional resistance, primarily against the detrimental impact of moisture that weakens corrugated board.

Corrugated is also available in various formats. Single face corrugated has one liner attached to the fluted medium, can be wrapped around products, and is used primarily for cushioning against impact. Single wall corrugated consists of two liners separated by the fluted medium - called “3 lines” in Azerbaijan. Double wall corrugated consists of a liner, fluted medium, liner, fluted medium and liner - called “5 lines” in Azerbaijan. Double wall corrugated has greater impact

strength and greater stacking strength than single wall corrugated. Triple and higher wall constructions accommodate applications requiring extra strength

Bringing the above considerations into observations in Azerbaijan reveals that manufacturing varies significantly between the three corrugated manufacturers in Azerbaijan and imported corrugated, primarily from Iran and Turkey. Azersun, claims to build corrugated to ISO standards, and offered their testing protocols to verify compliance. Safari prepared board without visible laboratory testing facilities. This does not suggest that quality manufactured cannot be obtained without testing and quality control, but it means quality cannot be assured, and that line variations effecting quality may proceed unabated.

Interviews with corrugated users included frequent statements that Azerbaijani corrugated quality varies and is often considered poor. "Poor quality" can result from many causes, such as poor appearance initially or after use, or poor performance – the latter being most likely. Poor performance may be due to poorly made raw materials (liner, medium, glue or adhesive), poorly manufactured board (glue between liner and flute failure), crushed flutes (during or after manufacturing), or inconsistent board characteristics. More probably, however, is that poor performance is the result of using or specifying the wrong board for the product or application.

This problem is exacerbated by the absence of any board designation being printed on the corrugated box. Corrugated box manufacturers in the US, for example, print a manufacturer's certification stamp on each manufactured shipper which includes the name of the manufacturer and the value of performance characteristics: burst (resistance to impact) or column crush (stacking ability) limits. The reported value implies or designates the board construction. No such stamp was evident on any shipper manufactured in Azerbaijan. This does not suggest that shippers are not compliant with international standards, but rather that there is no way, save testing or direct specification from the manufacturer, to identify the construction of the board. Poor performance may therefore be attributable to poor quality of board, inadequate specifications for the choice of board, or no specifications for the board that is chosen for the task.

Corrugated manufacturers in Azerbaijan include Azersun and Safari and another company (see Annex C for company descriptions). Corrugated boxes are made by these three companies as well as many small box makers who convert corrugated board that they purchase, primarily from Azersun. The breakdown of Azerbaijani corrugated box availability in the northern region was reported to be 60% supplied by Azersun, 30% by Safari, and the remaining 10% from numerous small box makers. Other regions are served by the three corrugated manufacturers and various box makers, with Azersun as the major Azerbaijani supplier. In addition, numerous imported Turkish and Iranian corrugated containers were observed in the agricultural sector.

Total capacity for corrugated boxes, using Azersun capacity for agricultural shippers of 14.4 million per year, Safari capacity of 2.4 million per year, adding the third corrugated producer equivalent to Safari of 2.4 million per year, and allowing .8 million boxes from the multiple box makers, yields an approximate annual capacity of 20 million corrugated boxes. With 60% capacity reported by Azersun, and utilizing similar for others (Safari reported 20% downtime so 60% appears reasonable), total production is 12 million boxes.

A1b. Wood

Wood crates have been associated with Azerbaijani produce in Russia and CIS countries. Sellers therefore welcome exporting Azerbaijani products in wood since they "brand" the product. Wood crates also have the ability to work well in cold storage. Corrugated shippers – unless specifically designed for this application (i.e., double-wall corrugated shippers with moisture resistant construction) – absorb moisture in these environments which weakens their strength.

Another "advantage" of wood from the standpoint of the traders is the questionable practice of selling declared weight with the crate included. This practice essentially sells the wood crate for produce costs and creates an economic advantage to the traders, as weight for a small crate is 500-600 grams; large crates 1-1.1 Kg.

Competing against these attributes is the ban on use of Azerbaijani wood for crate making to reduce deforestation and negative impacts on the environment. The wood crate manufacturers visited reported that their wood supply came from Russia, although it is indeterminate if all or part of the wood was so sourced. One of the companies visited prepared slats from logs and then used these slats, and wire for staples, to make crates. Other crate manufacturers purchase slats rather than make them.

Crates sell between 1.10 AZN and 5 AZN each. Based on producer information (see company descriptions in Annex C), crate production in the Guba region is estimated to be between 3.75 and 5 million crates. For Ganja, the estimate is based on two large wood crate manufacturers and 20 to 25 small scale manufacturers. If the two large crate makers prepare 500,000 crates each, and the smaller producers average 10% as much production, the total expected annual crate production from the Ganja region is 2 million. Total Azerbaijani production is estimated at 12 million wood crates per year.

A1c. Plastic

A general summary of the plastic sector reveals that the injection molding of performs and blow molding capabilities for PET and polyethylene bottles exists in Azerbaijan, as does injection molding for closures. Blown sheet lines exist for a variety of products including UV stabilized greenhouse covers. Although small producers might exist, most thermoformed containers were imported. An opportunity for producing thermoformed containers, primarily for food use, exists in Azerbaijan. Manufacturing of plastic crates for agricultural use is restricted to one company with a capacity far below the anticipated future demand for these crates.

Plastic buckets, used for emulsions, paints and lacquers are extrusion molded in Azerbaijan. There are two producers of PET preforms utilized to make plastic bottles for carbonated beverages, water, juices, vegetable oils and other products plus internal PET perform and bottle production for Azerbaijan bottlers for Coca-Cola and Pepsico. This appeared to be the only product line for PET. El-Plastic LLC produces a variety of blown films, blow molded containers, and injection molded closures through their substantial facility in Sumgayit.

There is one manufacturer of PE and PS foam products used for packaging (Azer Plast). PE foam is used to wrap durable goods and as a separator for fruit packaging. The PS trays are primarily used for poultry, and Azer Plast meets this demand. The trays are covered with imported PVC film.

As an oil producer, resin production could be a substantial value-added offering. Currently, there is only one plastic resin producer in Azerbaijan. However, there is great opportunity for investment in the plastic sectors as import customs, duties and transportation costs can raise resin costs up to 30% over international markets. The availability of Azerbaijani made resin, especially multiple types of resin, would substantially contribute to the growth of the packaging and other plastics sectors.

Converting opportunities also exist in Azerbaijan, but would also be linked to resin availability. No laminating and coextrusion capabilities were found and there is no availability of high barrier constructions. Building these capabilities would add competitiveness for processed foods, as well as other products.

A1d. Other Packaging

Glass. Many products are packaged in glass in Azerbaijan. Three years ago 95% of the glass used in Azerbaijan was imported, primarily from Georgia. Now 95% of the glass used is local production. Azerbaijan has two glass manufacturers: Caspian and Interglass. Caspian has two lines capable of producing 12 million jars each, for a production capacity of 24 million jars; Interglass has capabilities of 100 million containers. Company information was obtained from other consultants, with the observation that one manufacturer lacks the quality required for consistent production, and the other does not have an established track record. The AIC has also expressed interest in an investment to support colored glass production in Azerbaijan.

Metal. Metal packaging consists primarily of cans made from either tinplate steel (mostly for food products) or aluminum (mostly for beverages). Aluminum is used for foil, either directly (for products such as chocolate) or as part of a laminate (combined with polymers and sometimes paper). Aluminum is also sputtered onto polymer films in very thin layers (metalized film) for use with many products such as potato and snack chips packaging. Such laminates and films are not produced in Azerbaijan, and therefore are imported.

Manufacture of metal packaging in Azerbaijan is limited. There are two large producers that cover 80% of the demand. There are no easy-open lids made in Azerbaijan.

Paper and Paperboard. Paper is a cellulosic material that is thinner than paperboard. It is used in many forms, such as: single wrap, in multi-walled bags (such as the 4-ply 30-35 kg bags used to pack early potatoes), and as a component of flexible laminations (including aseptic packaging).

Paperboard (thicker form) is used for cartons (as opposed to corrugated shippers), beverage carriers, and dividers. Thicker fiberboard is used for edge protectors on pallets. This application (along with plastic edge protectors) was observed in cold storage and wood crate manufacturing facilities in Guba.

Flexible. Flexible materials can be in film form consisting of a single polymer (plastic), combinations of plastics, combinations of polymers with paper and/or aluminum foil; or other forms such as net structures or woven bags. Single polymer films, primarily polyethylene and UV stabilized polyethylene (for greenhouses) are made in Azerbaijan. Other films, laminated structures and co-extrusions were not observed in country.

Woven bags are used for fruits and vegetables. The fruit and vegetable bags can be made from natural fibers (such as jute (burlap) or raffia) or polymer (typically PP or PP/HDPE). These bags let in air allowing fruits and vegetables to respire and thereby maintain quality. They are used primarily for domestic use in Azerbaijan.

Aseptic packaging in box form is made from a roll of sophisticated laminated material that typically includes paper or paperboard, foil and polymers. The foil is included to provide barrier and slow product degradation (the reverse of fresh produce requirements). Aseptic laminates are not made in Azerbaijan, but imported and used in Azerbaijan. Considerations to manufacture laminations such as those used for aseptic packaging are included in the Annex D.

As previously mentioned, no converting operations except for printing were observed in Azerbaijan. Co-extrusion and laminating lines are a precursor for growth of plastic packaging, especially in barrier applications. Flexible barrier materials compete with glass for a considerable saving in weight and increased options for presentation design, such as pouches and stand-up pouches. The weight reduction reduces transportation costs which resulted in a shift from glass to plastic in many countries, especially those with long distribution channels. Airlines switched from glass to plastic for the same reason. Considerations for manufacturing laminated structures are presented in Annex D. In Azerbaijan, glass is considered to contain a premium product. As transportation distances are relatively short, weight considerations are less critical in Azerbaijan than in other countries. For these reasons, glass will maintain its market share with little foreseeable erosion by plastics.

Labeling. Packaging and labeling (and branding) is important to competitiveness and therefore to PSCEP, with an emphasis on the food sector: fruits and vegetables, processed foods, dairy products, processed meats and poultry. No specific labeling enterprises were visited, but pressure sensitive and stapled labels, such as those on wood crates, were observed.

More significant branding was observed in Az-Rus Dostluq in which preprinted white liner was applied to corrugated, resulting in an appealing, branded package. These shippers, however, came from Turkey. The labeling of these shippers and the stapled labels on wood crates were adequate for their tasks. No other labeling was addressed in this study.

Package processing. Package processing for food is included in this sector analysis because the package and the processing are interrelated such that one could practically not exist without the other.

In general, any processing procedure designed to extend the usable life of food products requires primary packaging—packaging in direct contact with the food. Food life can be extended by removing water, limiting microorganism growth through control of water (salting, freezing, other water control), controlling the atmosphere, etc. All of these beneficial effects can only be maintained through packaging.

Specific packaging/processing combinations for purposes of this report are thermal processing (canning) and aseptic processing. Thermal processing (applicable for metal cans, glass jars, or flexible (retort) pouches) involves placing a non-sterile food product into a non-sterile package, and then heat sterilizing this system. Aseptic packaging requires putting a sterile food product into a sterile package and sealing the package in a sterile environment. Since it is easier to sterilize packaging films than formed containers, many aseptic packages are formed from rollstock within the packaging machine. Azerbaijan has aseptic packaging lines, but no manufacturer for this rollstock.

Fresh fruits and vegetables are living products as mentioned above. "Processing" of these products include cleaning and sorting. A concentration on production (maximum output) suggests that all product be included without sorting. Competitive positioning, however, is enhanced with sorting by quality (larger, better color and/or shape) produce may command a higher price. One interpretation, never encountered outside of Azerbaijan, is an explanation that unsorted, unwashed fruits and vegetables denote "organic" and "fresh," and are therefore preferred. This interpretation is antithetical to building the packaging sector, but I suspect this interpretation of "fresh" will have a short market life.

Machinery. Packaging machinery includes machinery to prepare packaging materials for use, and a series of machines to form, open, fill, close, pack, bundle, and palletize products. These machines may be single purpose or combined, such as form-fill-seal machines. Some of the machines are primarily for packaging; some useable for many products. This is mentioned because companies interviewed expressed interest in building both packaging and other businesses, with a suitable example being the purchase of an injection molding machine capable of making packages, closures, disposable tableware, plastic chairs and numerous other products.

B. Agriculture

A major focus for this study is packaging used in the agricultural sector. Fresh produce can be packaged in corrugated shipping containers; wood crates; plastic crates; or paper, natural fiber or polymer sacks. Each will be discussed, with the emphasis primarily on corrugated containers, wood crates, and plastic crates.

The perception is that buyers in Russia and the CIS prefer wood due to its association with Azerbaijani produce. Even with the current financial crisis, the Russian market for Azerbaijani fruits and vegetables continues to grow. Perception is that wood keeps fruit more secure, although this is not necessarily true with properly chosen corrugated. Some buyers prefer corrugated for a somewhat suspect reason. Buyers can purchase fruit by the case, and sell it by the Kg. Wood crates allow an essentially standard fill to the top of the crate. Telescoping corrugated containers, however, offer the possibility of adding more fruit (packed by the buyer),

and preventing an overflow by containing the produce with the telescoping lid. This practice increases the amount of fruit the buyer can sell, however, promotes damage because the stacking strength of corrugated is eliminated if the telescope top is not resting on the wall of the bottom portion of the shipper. Best estimates are that this practice would yield damage exceeding 30%.

Different interviewees stated multiple packing for a given commodity, such as packing cucumber in 12 KG or 7 KG cases versus 7 or 14 Kg packs for tomatoes. Packaging materials for a given product varied between interviewees and also within different parts of the same interview. Cucumbers intended for export were reported to be packed in 12 Kg corrugated boxes, paper and paperboard; cherries and pomegranates were packed mostly in wood crates or corrugated containers. With conflicting statements between and within interviews, reported volumes and container count is an approximation.

Imports are also a significant contributor to the agricultural market, but not included in the estimates. The Azerbaijani companies have a significant opportunity for expansion with increased competitiveness with such imports, and significantly greater opportunities with corrugated and plastic than with wood. The advantages, disadvantages, opportunities and threats for corrugated, wood and plastic are presented in section IIIC, SWOT Analysis.

Total export of fresh fruits from Azerbaijan in 2007 was reported as 191, 390 tons.[2] The estimated breakdown for these exports is Apples – 50%, persimmons – 30%, pomegranate – 15%, cherries – 2%, grapes & other – 3%. Total export of fresh vegetables from Azerbaijan in 2007 was 52,183.9 tons with an estimated breakdown: Greenhouse vegetables (tomato & cucumber) – 45%, early potatoes –30%, early onions – 12%, carrot – 5%, other (pepper, eggplant…) – 8%. Juice exports in 2007 were 40,689.5 metric tons. Estimated breakdown is pomegranate juices – 76%, Apple juice – 19%, other juice – 5%.

Table 4: Azerbaijani Agricultural Production and Packaging, 2007

	Yield (MT)	Domestic (MT)	Export 2007 (MT)	Packing Kg/case	Packaging % by type*
Early Potatoes	110,000	47,025	62,975	30-35	100B
Hazelnuts	50,000	30,000	20,000	7	50C, 50W
Hazelnuts-processed	22,500	12,500	10,000	7	100C
Persimmons	65,000	8,000	57,000	32	100W
Tomato	25,000	13,000	12,000	7 or 14	80W, 20C or 60W, 20C, 20P
Cucumber	20,000	8,500	11,500	7	50C, 50P
Cherries	50,000	12,000	38,000	16	50C, 50W
Pomegranate-fresh	110,000	81,000	29,000	32	100W
Pomegranate-processed	13,000	0	13,000	12	100C
Apples	360,700	265700	95,000	32	100C
Other	8,000	5,000	3,000	10	45C, 35W, 20P
Total	834200	485,725	351,475		

Source: AAC Agricultural Sector Report and estimated values from interviews

[2] Azerbaijan Agribusiness Center. Azerbaijan Agricultural Sector Assessment Report prepared for PSCEP. November 2008.

* Packaging: C=corrugated; W=wood crates; P=plastic crates; B=multi-wall bags

The report combines these export figures and interviewee statements to generate the tables and estimate agricultural packaging usage, including number of corrugated shippers, wood crates and plastic crates. Additional reports available through the PSCEP office had a different breakdown which showed commodities as a percent of total fruit and vegetable exports. The consultant used the chart to present the estimated case count for the individual commodities. The packing per case is chosen as an approximate average for commodities with either multiple packings or for those commodities for which packing information was unavailable.

Table 5: Estimated Packaging Volumes for Azerbaijani Agricultural Products

	% of Exports	Packing Kg/case	No. Boxes Corrugated	No. Wood Crates	No. Plastic Crates
Apples	50	32	11,271,875		
Persimmons	30	32		2,031,250	
Pomegranate	15	32		3,437,500	
Cherries	2	16	1,562,500	1,562,500	
Grapes + other	3	16	179,438	179,438	
Total Fruits	**100**		**13,013,813**	**7,210,688**	
Tomato	23	10	500,000	1,750,000	250,000
Cucumber	22	7	1,428,571		1,428,771
Early Tomato	30	10	313,104	1,095,864	156,552
Early Onion	12	10	219,174	281,795	125,242
Carrot	5	10	104,368	130,760	26,092
Other	8	10	146,115	187,862	83,494
Total Vegetable	**100**		**2,711,332**	**3,446,281**	**2,069,951**
Total Fruits & Vegetables			**15,725,145**	**10,656,969**	**2,069,951**
Juice- Apple	19	12	644,250		
Pomegranate	76	12	2,577,000		
Other	5	12	169,542		
Total Juice	**100**		**3,390,792**		
Total Ag Packaging			**19,115,937**	**10,656,969**	**2,069,951**

SECTION III: SUBSECTOR AND VALUE CHAIN ASSESSMENT

A. Value Chain Description and Mapping

A descriptive value chain is presented for movement of fresh produce from farm to market, followed by value chain maps for each corrugated, wood and plastic. This section concludes with a map of packaging component manufacture for the agricultural sector (corrugated containers, wood crates and plastic crates) with their raw material input and waste output in Azerbaijan today. This map is revised (in red) to signify opportunities to bring components into Azerbaijan and improve the efficiency and competitiveness of the sector.

A1. Value Chain for Fresh Produce from Farm to Market

The first value chain addresses what happens to fresh produce between the farm and the end user. The trader concept appears to be well established in Azerbaijan in terms of passing goods from one stage to another, but with little control or audit along this path. Some observations suggest that consumers in Russia and the CIS prefer Azerbaijani produce over Turkish and Iranian produce, and identify the Azerbaijani produce by the wood crate in which it is packed. As noted above, traders, on the other hand, may have preference for telescoping corrugated shippers (two component shippers with a separate top and bottom), because they buy produce from the farmer by the box, and sell the produce by the kilogram. While the two containers, the wood crate and corrugated shipper, will hold equal quantities of produce if the shipper cover is in its down-most position; when telescoped, the shipper allows additional produce to be contained thereby offering an advantage for the trader.

A segmented value chain in which each participant maintains interest only in his direct involvement with the product may seem to optimize the individual competitive components but decreases the efficiency of the system. For example, the total quality of delivered products is greatly enhanced if all signs of bruising are absent. Molded pulp or foam pads placed between layers of produce in a shipper or crate provide protection against bruising that occurs when truck transport experiences potholes or other sudden changes in the ride. This overall quality improves the sector, promotes sales, and offers a competitive differentiation. In a segmented value chain, however, the benefits are separated from the person likely to be able to insert the pad. Coordination of the steps of the value chain, therefore, would enhance the value by allowing optimization of the entire process rather than each individual component.

The value chain after the farm gate begins with sorting, sometimes cleaning, selecting and packaging produce for transport. Packaging here is used in its most inclusive form which includes piling it into a truck, placing produce in bags or sacks, placing it in crates (wood or plastic) or shipping containers, or individually wrapping each component. The first is inefficient unless employed for specific purposes, such as delivering potatoes to a potato chip manufacturer. The last item is costly and reserved for specialty products that can justify the cost (for example, Japan). For purposes here, the produce is placed in some form of conveyance in quantities typically measured in Kilograms.

The least expensive conveyance is a burlap or jute bag. These typically hold produce in the vicinity of 20 Kg. Large paper bags may serve the same purpose. The bags are inexpensive and

reusable. Next come synthetic manifestations of the bag system, usually a matrix of polypropylene filaments formed into a bag structure. Each of these contain the produce, but offer little or no resistance to crushing experienced in the lower layers, and exacerbated by shocks associated with road imperfections such as potholes. Crates and boxes absorb the vertical forces of produce packages above, as long as the produce is not bulging[3] the container and as long as the container is not deformed. In these cases, any advantage of the crates or boxes is compromised.

Once contained, produce is loaded onto a conveyance, typically truck transport or rail, to another location that may be storage or continued transportation (which now includes ships). If stored, the produce will be impacted by temperature, humidity, atmosphere, and crushing. In addition, it is subject to spilling and bruising as it is transferred. Produce is also liable for attack by birds, insects, rodents, microorganisms and other living creatures, resulting in loss (unusable) or decreased value. Lettuce, for example, may lose significant weight as outer leaves are removed when they wither or turn brown. The head count remains constant; the value does not. The length of storage and the specific commodity will impact the results. Produce may go through a series of storage and transportation cycles, each of which provides opportunity for bruising, crushing, attack, and theft.

Processing typically adds cleaning, sorting, and some form of processing to enhance shelf life or convert into value added products. The value added products typically go through a series of packaging, transfer, transport, storage and sale, but since value has been added, better tracking and control is applied. Losses of unprocessed foods range between 10 and 60%. Losses for processed foods are more typically in the single digit to 15% range. The ultimate consumer may be a personal buyer or a processor.

A2. Value Chain for Corrugated Shippers

Corrugated shippers are constructed from liner board and a medium material that are sourced from a paper/paperboard manufacturer. There currently is no paper producer in Azerbaijan, so all medium and liners are imported. The liner and medium papers are delivered in rolls to the corrugated factory (outlined in dashed lines on the value chain map) where it is combined into corrugated board.

Corrugated board can be made in single or multi-walled structures. In the value chain map, single and multi-wall structures are made in the corrugator with additional stages to add an extra fluted medium and additional liner to single wall to crate double wall, and similar additions to build the desirable board.

The board is then cut into sheets and sent to a printer. The printers typically utilize flexographic plates which are applied to rollers that transfer one color per roll, and multiple stations allow multiple colors. Figure 3 below, shows the value chain for up to eight colors, with coatings counted as a color. Two to four color printing is more common.

[3] An example of "bulging" is the practice of adding produce to a telescoping container such that the container walls no longer support the product load.

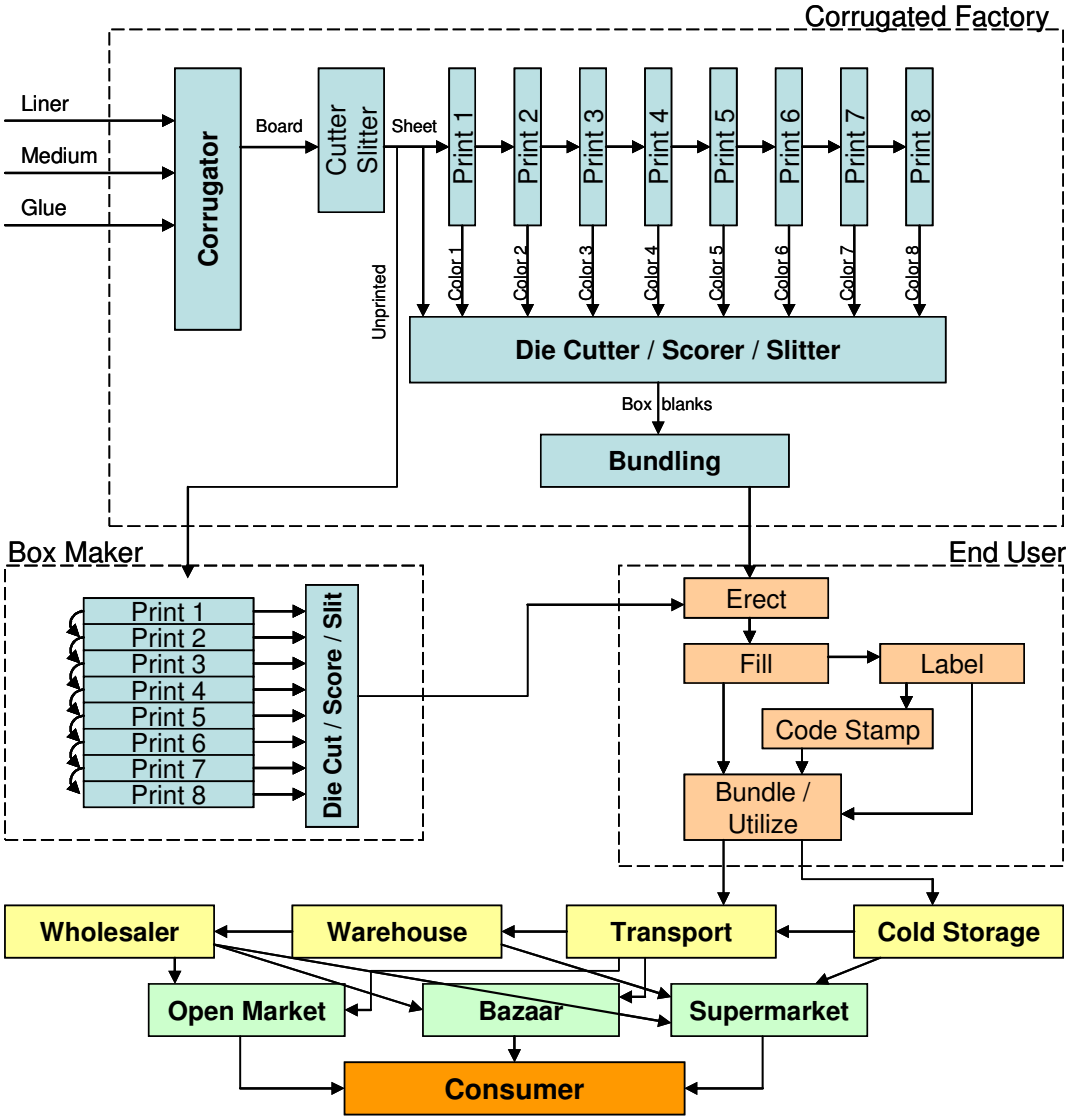
After printing, corrugated board is die-cut to create flaps and vent holes to allow fresh produce to breathe, and scored to allow for easy bending to form the box. The blank at this point can look like the example below.

Another method to develop high quality shippers is to utilize a pre-printed liner sheet in the construction of the corrugated. This method was likely used with the Az-Rus Dostlug shipper pictured in IIA4 above. Pre-printing the liner allows for high quality printing because the liner is flat and flexible whereas liner on corrugated board is flat and supported differently on the peaks of the fluting versus the valleys. However, pre-printed liner stock is only viable for substantial runs of the same printed sheet.

The printed, die-cut blanks are then bundled and shipped to the end user (designated by a dashed outline). The end user erects the shipping container (many are designed to snap together, some are glued or stapled to form the container), filled, labeled if not printed, bundled and transported to the appropriate market.

Unprinted corrugated board can also be sold to a box maker who performs the converting operations to prepare printed boxes. It is possible that a box maker could also prepare unprinted boxes for small orders that are not profitable for the corrugated manufacturer.

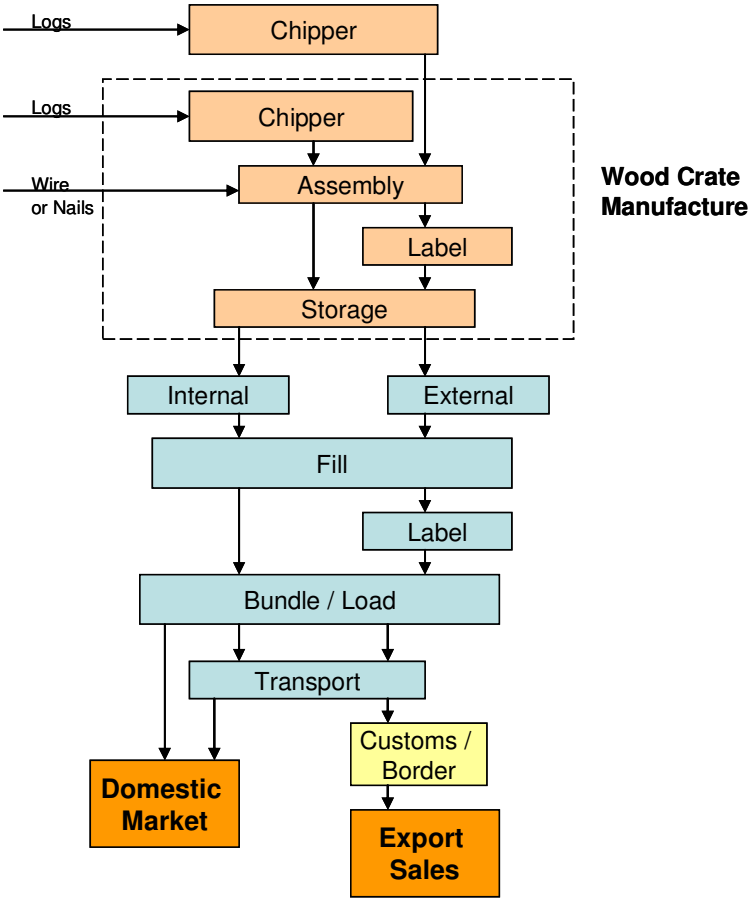
Figure 3: Azerbaijani Value Chain – Corrugated Board



A3. Value Chain for Wood Crates

Wood crate manufacture begins with logs that are cut into slats. This operation can be done within the crate manufacturer or performed by an outside company. Both options are shown in the value chain map below (Figure 4). In addition to wood, either nails or wire for staples is brought into the facility.

Figure 4: Azerbaijani Value Chain – Corrugated Board

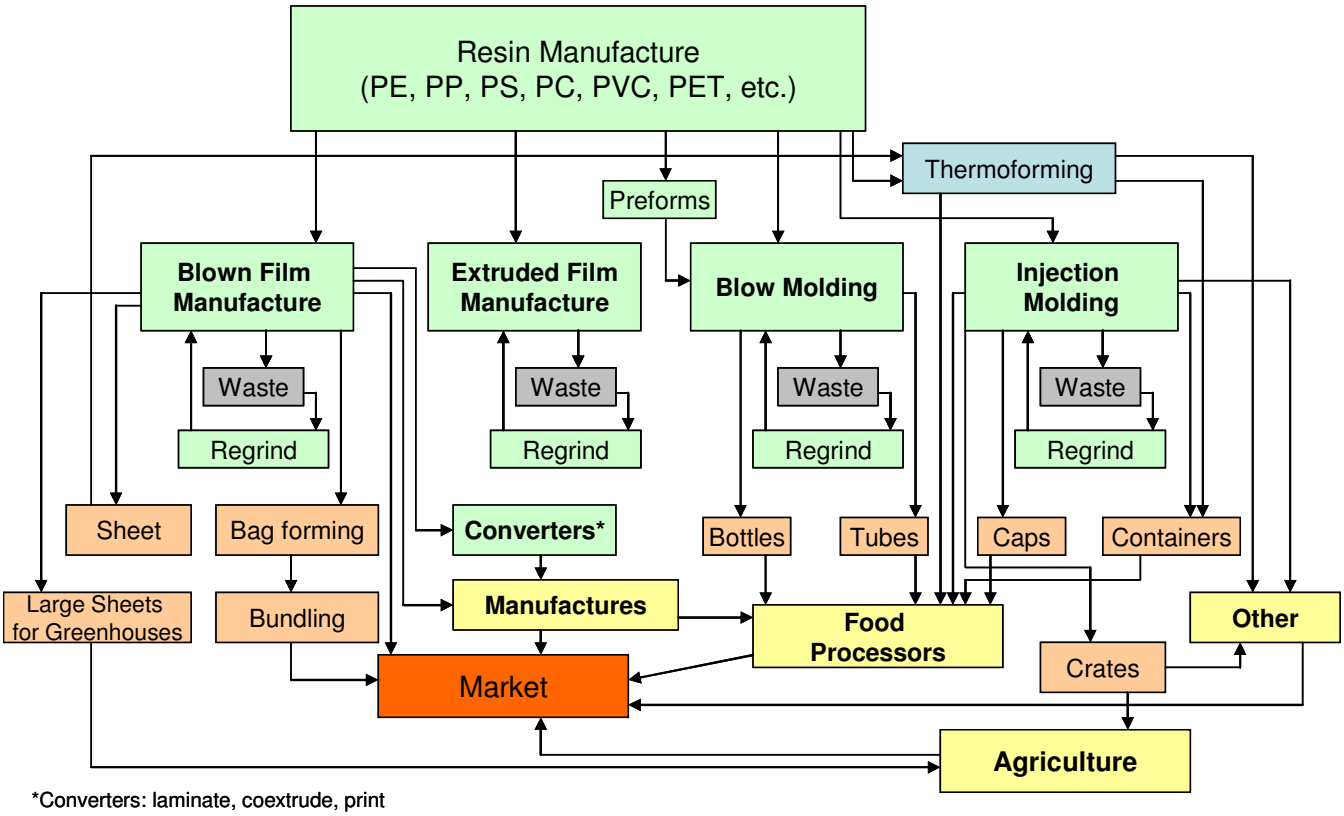


Waste utilization, as shown, is currently burned. However, this presents an opportunity to recycle the waste for paper making, chip board manufacture, and home heating (briquettes), all of which are presented in section IVC4 of the action plan.

A4. Value Chain for Plastic Packaging

Plastic manufacture takes many forms including film and sheet manufacture (sheet is the designation for thicker forms than film), thermoforming, blow molding, injection molding and other techniques, such as rotation molding. Blown films are used for packaging, greenhouse and many other uses. Extruded film and sheet is used for making thermoformed containers, used for food products, such as sour cream and many other products. Blow molding is used for making bottles for both food and other uses, and other products. Injection molding is used for making closures, containers and many other products including automobile parts. The agricultural and food applications are emphasized in the value chain for plastic manufacture, presented in Figure 5 below.

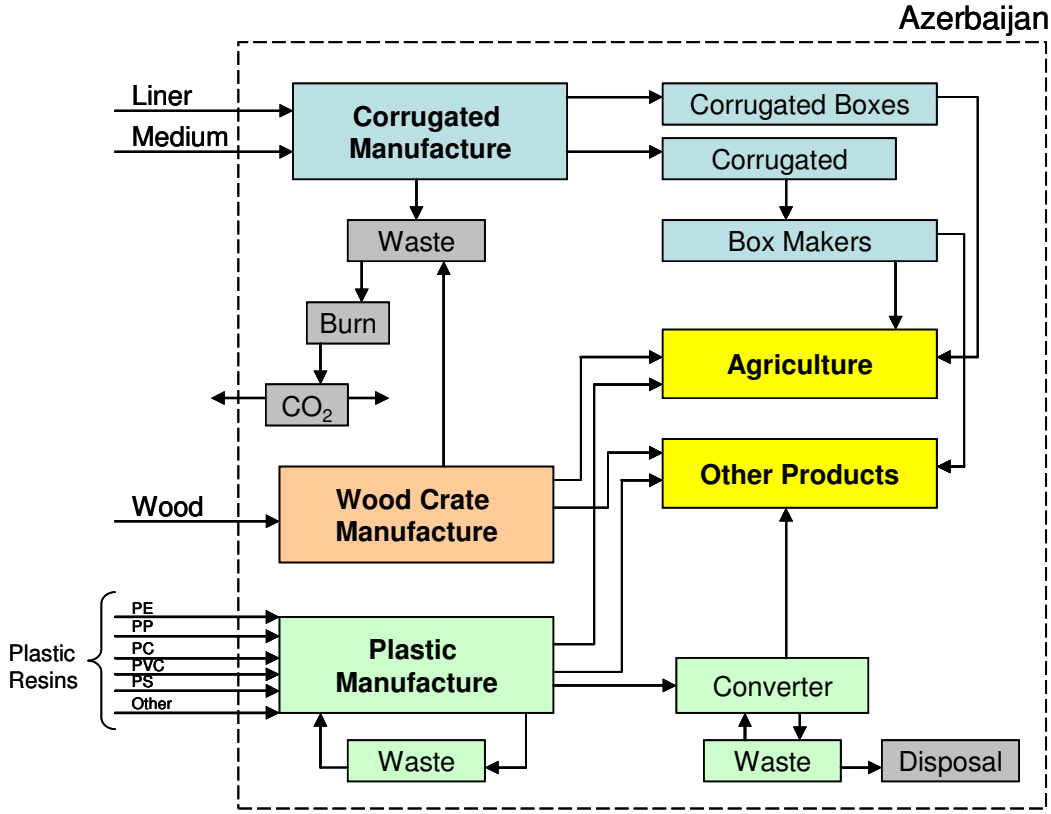
Figure 5: Value Chain – Plastics



A5. Agricultural Value Chain for Packaging in Azerbaijan

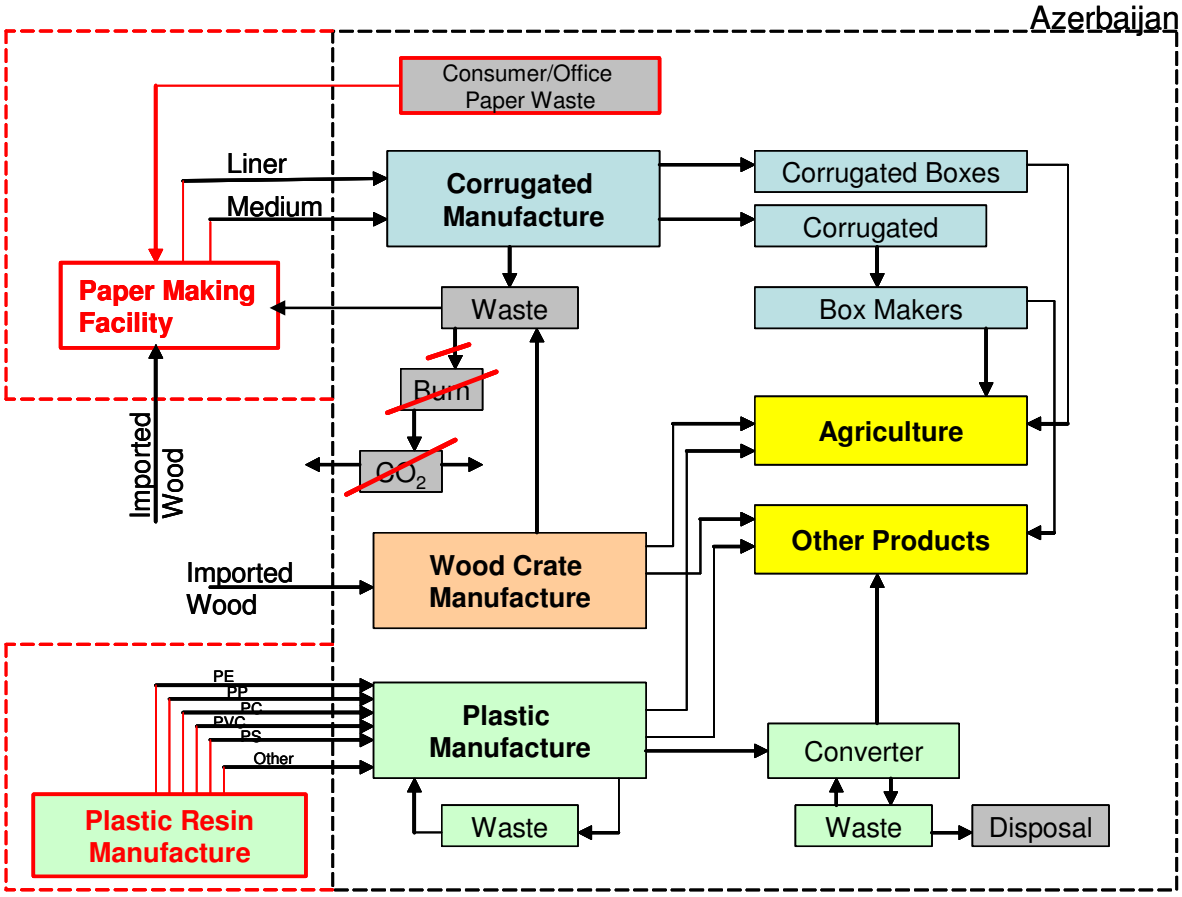
The combined packaging sector value chain for Azerbaijani of agricultural produce and other products is presented below (Figure 6). The dotted outline signifies Azerbaijan. Inputs outside the dotted are manufactured imports. Imports of completed packaging components are not included.

Figure 6: Agriculture Value Chain for Packaging in Azerbaijan 2009



The report modified the above value chain to present a future scenario in which plastic resin manufacture (value-added product of the petroleum industry) and paper-making capabilities (proposed in section IVB in the Action Plan below). The paper-making proposal includes adding paper-recycling facilities in Azerbaijan, and the total of these facilities is included as a box in the value chain. The revised value chain, with new components illustrated in red, is presented in Figure 7 below.

Figure 7: Packaging Value Chain in Azerbaijan beyond 2009



B. Technical Assessment

B1. Industry Assessment

Many of the problems reported in the interviews with various companies concerned the "poor quality" of Azerbaijani packaging. It is unrealistic to consider that manufacturers would routinely accept poor quality unless they were confident that quality was not a factor in the decision to buy. The only instance in which quality does not impact the decision to buy is either in a planned economy which offers no choice, or an economy of shortage in which demand exceeds supply. Neither of those conditions exists in Azerbaijan. The incidence of "poor quality" must therefore have other causes.

Corrugated Board. A relatively common way to have "poor quality" from otherwise reasonably well-assembled components is to choose packaging that is inadequate for the task. This occurs if selected corrugated board is inadequate to support the weight of product, or if used in conditions that degrade its characteristics, such as a humid environment. The implication of this discussion is that well-made board applied to unrealistic packaging circumstances will always perform poorly and any improvements in production of the same board will remain inadequate. The solutions are to either change the dimensions or change the corrugated such that the corrugated board matches the application.

A key problem is that none of the board observed in Azerbaijan had any designation to indicate its characteristics. The flute designation is easily determined visually by anyone trained in the relative flute characteristics; however, the strength of the liners, which relates to the liner basis weight (g/m^2 or lb/1000ft^2) or "grammage," cannot be determined without laboratory analysis. Thus, there is no way, save declaration by the manufacturer, to know the characteristics of the corrugated board.

With the realization that the above description of "poor quality" is due to a lack of industry specifications, which contributes to a poor choice of or inappropriate use of packaging for a product, rather than poor manufacturing of the actual packaging. **The Azerbaijani packaging industry, therefore, is losing major market opportunities in corrugated shipping containers to Iran and Turkey.** The net result is that Azerbaijani corrugated is non-competitive to an even greater degree than their ability to manufacture board would suggest.

Wood Crates. The wood crate sector seems adequately supplied by a combination of a few large and many small manufacturers. Some of these manufacturers are established; some are very small local enterprises. The Azerbaijani ban on logging will ultimately impact the wood crate industry. It is expected that corrugated shippers and to a lesser extent plastic crates will expand at the expense of wood crate sales. However, as wood crates are perceived as good quality and have an extended use, it is very unlikely that wood crates will disappear from agricultural packaging sector in Azerbaijan

Plastic packaging. In Azerbaijan, plastic packaging is limited to relatively simple packaging and imports. Little plastic resin is produced in Azerbaijan and all visited facilities are limited to plastic structures consisting of a single polymer. No barrier polymers, co-extrusions or laminations were observed in Azerbaijan. The advantages of plastics in terms of flexibility of design, resistance to moisture, recyclability (not a factor at this time, but one that will grow in importance), and weight will result in an expansion of this sub-sector, with significant expansion following increased resin production in Azerbaijan.

Glass manufacturing. In the past three years, Azerbaijan has expanded its glass production, to which now meet 95% of the demand for glassware. Glass was reported to be preferred for many products and denotes quality. The US and European Union have experienced a trend to replace glass with plastics because of a combination of weight (increases transportation costs), design, noise and safety issues. This trend could be experienced in Azerbaijan in the future, but is unlikely to occur until the plastic industry expands and includes coextrusions and laminations that can be used for high barrier products.

Industry Constraints:

- Availability of high quality, reasonably priced packaging materials from Iran and Turkey;
- Inability of local markets to accept and/or upgrade to new packaging systems because of cost;
- Companies are reluctant to invest in new packaging (due to perception that consumers prefer unwashed, poorly packaged agricultural products suggest they are "organic" and "fresh");

- Small local market size leads to small packaging orders, which discourages investment and modernization, and precludes taking advantage of economies of scale;
- The industry has no association or unified voice to project the contribution of packaging to the economy;
- The lack of consistent construction or specifications;
- There is a lack of vital data on the packaging industry and consumption patterns;
- Facilities for packaging design, testing and education are lacking; and
- Low or inadequate technology and skills in packaging.

B2. Benchmark

Corrugated shipping containers are the most common choice for distributing products around the world because of a combination of high strength with low weight, low cost compared with alternatives, and functional flexibility. Corrugated can be designed for any individual product to provide adequate impact protection and stacking strength, with minimal materials, and provide maximum utilization of pallet and truck space.

Corrugated shipping containers account for 90% of the distribution packaging in the US for both domestic and exported products. The US corrugated industry could be considered the "gold standard" for benchmarks with $24.7 billion in sales and approximately 1,300 facilities (compared with 3 in Azerbaijan) employing 80,000 workers.

C. SWOT Analysis

Following are SWOT analysis tables for corrugated shipping containers, wood crates, and plastic crates.

Corrugated Shippers - SWOT Analysis Summary Table

Strengths	**Weakness**
Lightweight Available in different strengths Low cost Easily printed/decorated Insulating value Easily sold to supermarkets Recyclable Preferred for apples and stone fruits Saves Azerbaijani trees Allows traders to add extra product (sales)	Loses strength in cold storage Requires repacking for cold storage - Moisture reduces strength - Moisture can promote mold growth Lack of industry specifications in Azerbaijan Weaker stacking strength than wood Weaker impact strength than wood More crushing if trader adds extra product
Opportunities	**Threats**
Wood ban Developing and utilizing specifications Users understanding specifications Recycle network being considered Import duties on corrugated boxes favor local production	Growth of cold storage Availability of plastic crates Strength of wood crates

Wood Crates - SWOT Analysis Summary Table

Strengths	**Weakness**
Stacking strength Impact strength Perception of quality Can be size adjusted (cut slats) Simple choice (size) Durable Useful for multiple environments Useful for cold storage Preferred for cherries and berries Trade advantage when incorporated into weight	Not insulating Can be attacked by insects More expensive than corrugated Lower manufacture speed than alternatives Heavier than alternatives
Opportunities	**Threats**
Growth of cold storage	Wood ban Potential to harbor parasites

Plastic Crates - SWOT Analysis Summary Table

Strengths	**Weakness**
Lightweight Available in different strengths Works in cold storage Saves Azerbaijani trees Not sensitive to moisture Inert to molds/microorganisms Impervious to attack by insects and rodents	Lack of availability/production in Azerbaijan Limited resin availability in Azerbaijan Difficult to print/decorate/label
Opportunities	**Threats**
Wood ban Better suited to use for cold storage vs. corrugated Branded molding if quantities justify	Lack of Azerbaijani resin Monopolistic domestic resin production increases costs for local product Import duties on resins Increase in oil prices increases resin costs

D. Value Chain Development Strategy

To enhance the competitiveness of Azerbaijan's agricultural products through packaging, the most effective strategy is to consider promotion/growth for corrugated and plastic. Growth of the wood crate manufacturers is not included in this strategy because of the ban on tree harvesting, environmental implications, and it is an industry populated by numerous small suppliers for which individual investment would be less productive than other considerations.

Corrugated growth will involve improving the output capacity of existing companies, adding capacity with new companies, improving the efficiency of the production by considering recycling opportunities of cellulose fibers from both paperboard (including corrugated) and paper sources, and improving competitiveness of corrugated versus wood with a recommendation of a graphic indicator of Azerbaijani product to be applied to corrugated containers.

Utilization of waste generated by the wood and corrugated industries are also effective. Any waste represents a loss of resources and energy, and represents negative impact on the environment. Of more immediate importance to the companies involved, it represents a resource with potential economic advantages that are currently minimally explored (Azersun is the only company visited that handles waste in a productive manner).

The plastic sector will be considered for increasing plastic crate output as well as bringing quality plastic food packaging manufacturing capabilities into Azerbaijan. Plastic crates work in cold storage and therefore require no repacking as with corrugated. Wood crates are used for cold storage, but the wood ban will challenge continued availability. Production capacity for plastic crate is currently limited in Azerbaijan and increasing supply is recommended.

Industrial waste generated in the plastic and glass industries should not be included among PSCEP's activities because these wastes are typically returned to the manufacturing process. One of the visited plastic bottle plants even collects used bottles for further use. Glass and plastic are easily melted and reused in the manufacturing process. Plastics, especially homopolymer structures, are typically extruded and palletized, and this remanufacture of polymer waste is an important contributor to the competitiveness of plastics.

The general health of the packaging sector will be enhanced on a short- and long-term basis by considering a program to bring specifications to the industry to better define packaging materials and their capabilities for the benefit of both producers and users, and to improve Azerbaijani competitiveness against foreign producers that have already implemented comparable standards. Although there is an Institute of Standardization in Azerbaijan, it is easier and therefore preferable to develop voluntary standards within the industry.

Longer-term strategies: provide health to the packaging sector specifically, and enhance the competitiveness of Azerbaijan as a whole. These require building a competitive packaging industry in terms of containment, protection and marketing functions. Competing in a global market requires a diverse choice of packaging, prepared from industry within the country, and manufactured in an environmentally responsive manner. The functions necessary to build this competitiveness are:

- Enhance paper-making capabilities in Azerbaijan – at least from recycled fibers if wood sources are unavailable;
- Develop resin making capabilities for a variety of polymers in Azerbaijan;
- Strengthen plastics sector with variety of material and formed packaging choices;
- Add laminating and coextrusion capabilities to Azerbaijani plastics capabilities;
- Develop marketing capabilities of packaging with branding and unique designs and graphics;
- Support recycling, reuse, collection, sorting and aftermarket capabilities;
- Utilize waste products for product development; and
- Increase knowledge about packaging through programs that:
    - Add packaging courses to marketing/business curricula at the universities
    - Build training programs for packaging manufacture, specification and use

- Promote international exchange of packaging and product information through seminars, courses, interaction and programs with other packaging institutes, participation in international conferences, and organizing conferences and symposia in Azerbaijan.

SECTION IV: ACTION PLAN

The objective of the PSCEP program is to enhance competitiveness through actions that can be accomplished within the life-of-project of 3 years and that can enhance investments to build manufacturing capability, and increase sales and jobs. As discussed earlier, attitude concerning packaging is a key development indicator, so a portion of the action plan is to promote more competitive packaging compared to foreign imports, and increase consideration of the marketing functions of packaging.

The Action Plan has been divided into three target areas: (1) firm level assistance and access to finance; (2) Association building and develop an Azerbaijani Packaging Association or institute to enhance packaging sector competitiveness; and (3)

A. Firm-level Support: Technical Assistance and Access to Finance

A1. Support to Corrugated Sector

Corrugated is the largest packaging component for agricultural products and is the most used distribution package in the modern world. Current demand for corrugated shippers in Azerbaijan is 20 million per year, however this level is expected to increase significantly in the future due to the wood ban. The level of local production for corrugated boxes is 12 million, however, all kraft paper needed for the liners and fluted material is currently imported, with no local capacity. Building this sector is therefore paramount to supporting the agricultural sector in Azerbaijan, as well as other consumer good sectors that use corrugated packaging materials.

The action plan builds the corrugated sector by building total capacity, improving competitiveness of some of the offerings that are currently less competitive, improving the efficiency of the sector (through re-utilization of fibers), and presenting standards to improve competitiveness of Azerbaijani products against imports.

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A1a. Safari - Increase output and enhance competitiveness with 5-color print capabilities

Safari is currently the second largest corrugated producer in Azerbaijan, and is the main supplier to agriculture producers and agribusiness in the Guba region. Accordingly, it is an important stakeholder for the sector's development. They combine liners and medium to corrugated board that they convert into shipping containers, 80 percent of which are used for export of Azerbaijani produce. Safari also produces board for other small box producers in the region.

The company has one Russian-made production line capable of producing 150 – 200,000 corrugated boxes per month. They have 2 and 3 color printing capability and can die-cut and score to customer requirements.

In meetings with Safari, the company reported downtime of 20% on their line (see company description Annex C) due to printer problems. Management expressed the need to replace the printer which will not only improve productivity but also enhance the competitiveness of their product against Turkish imports. The existing line offers 3-color printing (3-one color flexographic printers) with 2-color printing evident on the day of the interview. Replacing the 3-color system with a 5-color system[4] offers improved quality, more flexibility, and capabilities to increase the corrugated manufacturing line from one 8-hour shift per day to two 8-hour shifts per day. A second shift would require an additional 30 employees.

Safari currently produces 8000 boxes per day. A 6-day work week would yield 48,000 boxes, or a monthly production (using 4.2 weeks/month) of 201,600 boxes. Allowing 3 weeks for a combination of holidays, vacation and maintenance time, the yearly production is 2.5 million boxes. Selling price is between 0.40 and 0.80 AZN / box, and using the lower figure yields increased annual sales for a second shift of 960,000 AZN.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Replace 3-color printer with 5-color printer	90,000 AZN	Upon investment	6 months	1,000,000 AZN	30

As a significant supplier of corrugated shipping containers for the agricultural sector, by increasing Safari's production capacity and quality of graphics PSCEP will enhance the competitiveness of the packaging sector, especially in the Guba region. The timing for specific activities is presented in the Gantt chart in Annex A. In summary:

- Obtain investment: timing unknown, during this period specify country of manufacture, company and specific model and capabilities
- Order 5-color printer: 1 week
- Ship printer: ocean transport to Batumi or Poti, Georgia estimated 1 month assuming that the printer is in stock.
- Rail transport to Guba: including customs, licenses, permits, etc. estimated time 1 month assuming no unreasonable delays[5]*
- Installation and commissioning: 2 weeks assuming the plant has sufficient space for the printer installation, rails for the printer are of adequate length, and that the plant has adequate or excessive power capacity (correct voltage and phase) for the installation. If not, any necessary augmentation (rails and/or power) can be achieved during the shipping period so installation and assembly can proceed upon receipt of the printer.
- Inspection, if necessary
- Designing and ordering printing plates: 1 month
- Training and tuning for production: 4 weeks with proper training personnel
- Commence production: Month 5, after receipt of investment.

[4] 4-color printing is usually adequate for corrugated, but Safari supplied the quote for a 5-color press as stated below. The author believes that the quote is optimistic.

[5] Above estimates contingent upon no additional delays resulting from the current civil unrest in Georgia. If such delays are imminent, shipment can be arranged through Dubai.

A1b. Facilitate Investments in the Corrugated Sector through Investment Companies

Azerbaijan's equity funds can play a crucial role in providing investment capital to sector companies. PSCEP will work the AIC, CIIC, and KAIC in sector investments. Potential transactions described below are based on ongoing discussions.

A1bi. AIC Investment In Recycled-Board Plant

Azerbaijan Investment Company (AIC) is at the early stages of reviewing an investment in an Azersun plant to manufacture liner and medium (the components of corrugated board) from recycled paper.

The manufacture of liner board and fluting medium does not currently exist in Azerbaijan. This investment would allow these capabilities to be brought in-country, as well as to provide a use for recycled paper and paperboard. Liner board and fluted medium would replace imported paperboard (increasing domestic sales) but not significantly increasing corrugated production, however, the impact on waste utilization is also discussed below.

The facility to make paper from recycled fibers requires first building a recycling network in Azerbaijan. The current recycling level is 1% and substantial efforts will be required to build the network. The program would add two regional recycling centers within the first five 5 years to facilitate collection in Lenkoran and Guba. Collection in Baku and Sumgayit will be collected and brought to the plant directly rather than going through a regional recycling center.

The estimated quantity of recyclable paper in Azerbaijan is 1,512,000 tons per year. A recycling rate of approximately 30% (150 tons/day) would provide sufficient paper to run the plant at full capacity of 50,000 tons per year. The projection for the first year of production is 25,000 tons.

The approvals to begin building the physical plant are expected this summer, with building scheduled for one year. The recycling efforts and building the first centers should begin as soon as the project is approved and funds become available.

A recommendation that would help build a viable paper processing facility, as well as the recycling capabilities is to establish a wider the target of raw materials to include clean industrial waste from other corrugated manufacturers and box makers. The waste generated by these two industries is estimated at 800,000 tons per year and therefore offers a significant quantity of waste sourced from a limited number of identifiable sites. The fibers are currently burned at no cost or value to the manufacturer, and many of these manufacturers expressed a willingness to offer the waste to someone who would be willing to haul it away at no cost. It is unknown if this offer includes offering it to a competitor (Azersun currently recycles board with no inclusion from other manufacturers), but offering it to a new source for linerboard and fluted medium could offer a very different situation. This therefore presents an opportunity to obtain a source for cellulosic fibers for the cost of hauling. It also offers consistency for this portion of the raw material requirements.

Paper and paperboard obtain their strength from the cellulosic fibers. The kraft liners are stronger than other papers such as newsprint and fluted medium because the later products are

made by mechanical pulping (newsprint) or combination chemical and mechanical pulping (fluted medium) which tend to shorten fibers. Recycled fibers are also reworked, by definition, which shortens the fibers and results in a weaker paper. Most corrugated is made with fibers from virgin origin.

Virgin wood pulp can be added to recycled fibers to add strength. The procedures to convert wood to wood pulp include a de-barker, a chipping machine, a chemical digester, a mechanical pulper, a hydrapulper, blend chest and a refiner (that opens fibers to promote stronger paper). Use of recycled fibers replaces this list with a hydrapulper and a de-inker. Also considering the ban on cutting Azerbaijan trees preclude using a domestic source for wood pulp, therefore, wood pulp would need to be imported[6] unless such facilities were built in Azerbaijan.

As mentioned above, the wood crate industry generates an estimated 300 to 400 tons of wood waste per month. This quantity is minor in terms of paper production, (below 10% of the fiber requirements) but it is possible that this wood waste could be collected, driven to a pulping facility in a bordering country and then use the same trucks to return with virgin wood pulp. The fibers would have to be compatible with the pulper, but the possibility exists to utilize waste, provide back-haul capabilities to reduce transportation costs of both wood and virgin pulp to increase the strength of linerboard. Such an arrangement would become more important with time because every cycle of cellulosic fibers reduces their strength and a closed system (no influx of virgin pulp) would ultimately impact the quality of Azeri corrugated made from paperboard from a recycled source.

The total anticipated investment is 17, 337,000 AZN. Sales in the second year have been estimated at 9,654,000 AZN with an anticipated profit of 1,762, 041 AZN. One year is allowed in the business plan for plant construction with production starting in the year 2. The plant is designed to produce a maximum of 50,000 tons per year – 70% for liner board and 30% for fluting medium; with 50% production (150 tons per day) anticipated in the first year.

The schedule after receipt of investment is presented in the Gannt Chart in Annex A.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Recycled board Paperboard plant	17,337,000 AZN	Upon investment	24 months	9,654,000 AZN in year 2	250

Benchmarks: 78.3% of corrugated containers produced in the US in 2008 were recovered for recycling (25.6 million tons). The average corrugated box contains 43% recycled fiber. US retailers (especially large retailers and supermarkets) cannot afford to pay for disposal of the corrugated waste generated from delivery of products to their stores. These retailers therefore compress and bail used corrugated for sale and recycling. This example can be utilized to promote the recycling efforts in Azerbaijan to promote success of the above investment.

[6] No investigation was made for sources of wood pulp outside of Azerbaijan.

- According to the European Kraft Paper Producers for the Flexible Packaging Industry, the estimated cost to build and operate collection business in Russia with capacity of 100 tons per day is $15 million.
- Kievsky KBK, the major Ukrainian board mill, produces 50 – 60% of greyboard, fluting, and testliner, as well as other types of secondary fiber packaging. This Kiev mill is the largest and most modern paperboard manufacture outside Russia in the CIS with $66 million in sales in 2003. They employ 2300 workers. The June 2005 price for their board was $480 – 500 per ton.
- A pulp and paper company in Maryland produces paperboard from 100% recycled paper. The company has 85 employees, working 3 shifts, and has annual sales of $20 million.
- A project in Turtas (Tyumen region, Siberia) designates a $890 million investment for a Greenfield (virgin timber) mill to produce 450,000 tons of mechanical pulp annually with about 350,000 tons converted into coated paperboard, topliner and fluting.
- Corrugated waste in the US commands a current market price of $25 – 45 per ton. Greyboard (paperboard produced from recycled fibers) can command $500 – 550 per ton in Russia.

A1bii. CIIC investment in NAA Corrugated Plant

The Caspian International Investment Corporation (CIIC) is planning on investing in a corrugated production plant under the NAA Corporation in Ganja.[7] CIIC projects that the plant will have a manufacturing capacity of 1 million m^2 corrugated per month, with an assumed rate of production set at 40% for the years two to six. The yearly projected yield is 7.2 million m^2 and based on the approximation of 2.4 shippers (depending on size) made from 1 m^2 of corrugated, the new plant could prepare 11.52 million shippers annually. If 25% of their shippers were used for agricultural products, the number of shippers for agricultural use becomes 2.88 million.

The demand for corrugated shippers used for agricultural produce, as estimated and reported in section IIB is 19 million shippers. The estimated production output of corrugated shippers used for agricultural use is 12 million.

The above demand suggests that 7 million agricultural shippers are not met by the Azerbaijan corrugated industry, and likely met by imports, primarily from Iran and Turkey. Turkish paper and paperboard exports to Azerbaijan in 2007 were $41 million (Source: Export Promotion Center of Turkey). With Azerbaijan paper and paperboard imports in 2007 of $95 million (Source: The State Statistical Committee of the Republic of Azerbaijan), substantial opportunity exists to supplant imports with Azerbaijani shippers. Add to this figure, wood crate use for agricultural products in Azerbaijan is 10.6 million a year. Since this manufacture and demand are expected to decline in response to the wood ban, a portion of this figure will become increase demand for corrugated containers. If the demand for shippers for the non-agricultural sector increases (expected to do so, but information concerning Azersun's activity in the extended market is unavailable) there could be sufficient opportunity for additional corrugated capacity in

[7] The analysis is based on information gleaned from a select number of interviews, primarily with manufacturers versus consumers.

Azerbaijan, and the CIIC proposal would be the main supplier for the Western region. The marketing report will hopefully provide information for projections for both agricultural and non-agricultural demand.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
New corrugated plant in Ganja	4,100,000 AZN	Upon investment	24 months (for operations)	2,112,000 AZN per annum	14

The 24 month estimate is derived from a combination of one year to build a plant and check equipment and the presentation of production figures for 2010. No Gantt chart is presented.

A2. Support to Wood Sector

A2a. Abdullah Abdullayev – Development of fiberboard facility to utilize of wood waste

The owner of the wood crate manufacturer stated that his company generated 15 tons of wood waste every 3 days. Given a 6-days work week and 4.2 weeks per month, wood waste is estimated at 126 tons per month. This waste is currently burned, which has a detrimental impact on the environment and no business benefit for the cellulose fiber waste. A more productive utilization is to convert the wood waste into fiberboard for furniture manufacturing thus enhancing the competitiveness of the value chain. The owner is considering building a facility for this purpose, with raw materials for the operation generated by his wood crate manufacture. If we assume a composite sheet weight of 20 Kg, the facility could produce a maximum of 630,000 sheets per month (waste from trimming could be re-chipped and returned to the process).

Abdullah Abdullayev has written a business plan to build fiberboard capabilities adjacent to his wood crate manufacture. He seeks a loan for 800,000 AZN and claims this facility will create 75 jobs. No timing was given but the estimate presented in the chart represents 8 months to obtain financing and 4 months to set-up the line and begin production.

Ukranian greyboard sells for $500 – $550/ton. It is anticipated that fiberboard would sell for a higher price than greyboard, but as no market price is currently available, 500 AZN has been used for calculations. The raw materials are already generated from the wood crate manufacture and expenses will be for power and labor.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Fiberboard from wood	800,000 AZN	Initiate ASAP	12 months	756,000 AZN	75

A3. Support to Plastic Sector

Capabilities for preparing coextruded and laminated films are lacking in Azerbaijan. These technologies are required to prepare cost effective composite that utilize properties of multiple polymers and for the manufacture of high barrier structures including those used for aseptic processing. Polymer resins are also limited in supply in Azerbaijan and import duties make manufacturing costs less competitive. While a laminating line has not been included in this Action Plan, considerations for developing such a line are presented in the Annex D.

A3a. SAF Plastics – Development of PVC stretch film line

SAF Plastics was the first packaging company in Azerbaijan following the collapse of the Soviet Union. They supplied packaging for the Azerbaijani food industry, initially (1994) through imports from Iran and Turkey. Packages included PS and PP tubs for dairy products. In 1998, they established their own production line to localize production.

PS trays are used for the poultry industry, nuts, confections, meats and other products. The trays and product are typically covered with imported PVC stretch film. Yet this film, which is widely used in the food sector in Azerbaijan—restaurants, supermarkets, caterers, wedding palaces—to protect food and keep it hygienic and fresh for longer time, is not yet produced in Azerbaijan. It is therefore a missing component in the packaging value chain and the plastics sector of Azerbaijan.

To fill this market gap, SAF Plastics wishes to purchase a used PVC line from Propak International Company to bring these capabilities to Azerbaijan. PVC has experienced a decline in the developed world because it contains chlorine (the C in PVC) which has health and environmental implications. The basic PVC production line cost $500,000 and is now available (used) for $250,000. The entire equipment line including resin to start production is estimated at 300,000 AZN for which SAF seeks as an equity investment or loan. The entire project is 750,000 AZN, and construction of a new plant would bring the total to 1 million AZN, but the current need is for the line equipment.

PVC resin from Iran is $1100 – 1200 per ton. PVC film, imported form Turkey is $2500/ton, and sells in Azerbaijan for $3200 per ton. Capacity for the PVC line is 100 tons per month; total demand in Azerbaijan is 50 tons/month. With production at 50 tons per month, gross income is estimated at 200,000 AZN of which 50,000 AZN is profit.

They expect to be able to order the equipment in 4 months (September), one month to ship, and one month to install. Details of the project are presented in the Gantt chart in Annex A.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Purchase a PVC stretch film line	300,000 AZN	4 months	3 months	200,000 AZN/month	10 estimated

A3b. Azer Pak – Add Thermoform line

Azer Pak would like to add a thermoform line and thereby replace their current business of importing thermoformed containers with Azerbaijani production. The investment is for the thermoform line and a warehouse and is estimated at 1.1 AZN.

The proposed line consists of a sheet extruder, a thermoformer and a film printer (detailed below in IVA3iv). The equipment was priced 2 years ago from European sources and more recent inquiries suggest that prices could be reduced using Korean packaging machinery. The value of the investment request from Azer Pak has been kept at the same level in anticipation of using the savings gained by purchasing the Korean line to fund additional equipment, such as hoppers and re-grind equipment.

Expected production is 90 tons of sheet and 60 tons of formed containers per month with one 8-hour shift. No jobs or timing were presented by Azer Pak nor was the business plan presented. However, an estimated timeline is presented in the Gannt Chart and the steps are detailed below.

Sale prices vary with container composition, weight, size, design and demand. Polypropylene or polyethylene resins currently cost 50 to 52 cents per pound, $1.10 per Kg, or $1,100 per metric ton. The value-added for thermoformed containers is based on resin costs being 60% of the finished container price. This yields a sales price of 88,000 AZN per month or approximately 1 million AZN per year based on 1 ton of product equaling 1 ton of resin.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Install a thermoform line	1.6 million AZN	Upon investment	4 months	88,000 AZN per month	4

Azer Pak Thermoforming line installation would be a $2 million investment (1.6 million AZN), $1.2 million for the equipment for the thermoform line and $800,000 for the warehouse.
The following is based upon the existence of a suitable facility.

- Order extruder, thermoformer, printer: 2 week
- Order resin during transport, design and order appropriate thermoform molds.
- Ship printer, extruder and thermoformer by ocean transport to Batumi or Poti, Georgia: estimated 1 month assuming that the printer, extruder and thermoformer are in stock.
- Rail transport to Baku: with customs, licenses, permits, etc. estimated time 1 month assuming no unreasonable delays
- Installation and commissioning: 5 weeks assuming the plant has adequate or excessive power capacity (correct voltage and phase) for the installation or any necessary augmentation can be achieved during the shipping period such that installation can proceed upon receipt.
- Inspection, if necessary: 1 week
- Training and tuning for production: 4 weeks with proper training personnel.
- If necessary—ordering printing plates as necessary but many thermoformed containers re sold unprinted: 1 month
- Commence production: 5th month after receipt of investment.

A3c. Azer Pak – Upgrade to 8-color film printing line

Azer Pak has a 4-color printing line which produces 20% of their film. They import 8-color printed rollstock from Iran and Turkey which is 80% of their film offerings. Azer Pak also makes unprinted plastic bags that are sold in a printed bag containing 120 unprinted bags,

Azer Pak seeks a 350 – 500,000 Euro to purchase a German high-end printer to bring the 80% of their film offerings in-house.

Film cost is $2.7 - $3 per Kg. Printing film costs $2 per Kg and results in a sale price between 5.4 and 5.5 AZN per Kg

The total demand in Azerbaijan for printed film is 150 tons/month and Azer Pak intends to manufacture 90 tons/month with the line described in section IVA3iii above.

If 10 tons per month are allowed for unprinted plastic bags, and 20% of their bags are printed on their 4 color press, 64 tons of printed film are available for sale. Using an average price of 5.4 AZN per Kg, this presents 345,600 AZN in sales.

The timing for the printer installation is estimated to follow the timing of the thermoform line that will be installed concurrently.

Employees needed to operate the printer is unknown but estimated to be 4.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Install a printer line	500,000 AZN	Upon investment	7 months	345,600 AZN a month	4

The timing for the project is presented in the Gantt chart. The steps are written below.

Azer Pak Printer line installation, following receipt of 500,000 AZN investment:

- Order printer from Germany: 2 weeks
- Ship printer to Azerbaijan: 1 month, assuming printer is in stock.
- Order printing plates during transport: 1 month
- Allow entry into Azerbaijan with customs, licenses, permits, etc.: estimated time 1 month assuming no unreasonable delays
- Installation and commissioning: 5 weeks assuming the plant has sufficient space for the printer installation, and either that the plant has adequate or excessive power capacity (correct voltage and phase) for the installation or any necessary augmentation (rails and/or power) can be achieved during the shipping period such that installation can proceed upon receipt of the printer assembly at the plant site.
- Inspection, if necessary: 1 week
- Training and tuning for production: 4 weeks with proper training personnel.
- Commence production: 5th month after receipt of investment.

A4. Other Potential Investment Opportunities in the Packaging Sector

Since the end of the consultant's assignment, PSCEP has discussed a number of potential investments in the sector with the investment companies. Most prominent is a 5-7 AZN million investment in a glass/bottling manufacturing company to produce colored glass. PSCEP is in ongoing discussions with the AIC on support for this transaction.

B. Association Building: Develop an Azerbaijani Packaging Association or Institute to enhance packaging sector competitiveness

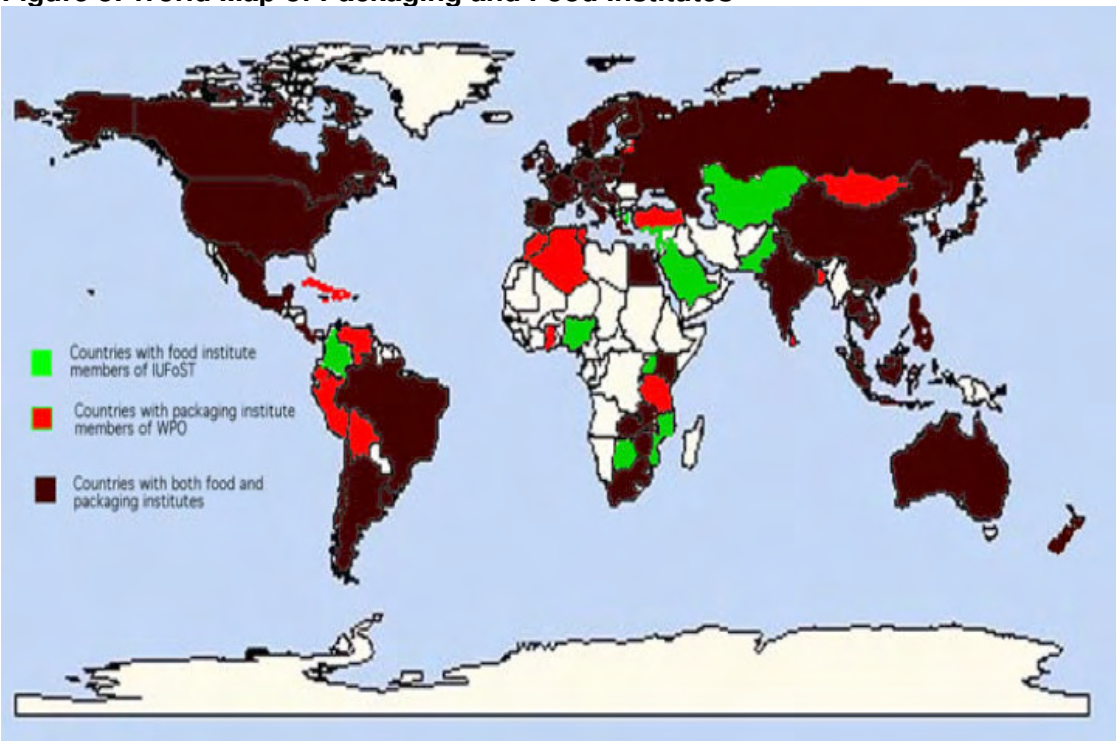
The discussions above in section IIB demonstrated that attitude concerning packaging relates to packaging quality and competitiveness, and further stated that standards for producing and defining packaging materials ranges from beneficial to essential to compete with imports. In addition to the technical containment and protection function of packaging, packaging design and graphics presents a product to a new market. Associations that bring packaging suppliers and packaging users together are valuable business sources for both users and suppliers.

Specific advantages provided by an Association which would promote competitiveness of the Azerbaijani packaging sector are as follows:

- Set voluntary standards that reduce product damage for users and allow suppliers to compete more effectively with foreign imports;
- Design a logo that defines/identifies Azerbaijani produce;
- Provide a forum to discuss and demonstrate marketing capabilities of packaging;
- Provide a forum to share packaging knowledge with the outside world; and
- Provide a forum to bring in outside experts for the benefit of the industry and offer seminars.

Voluntary cooperation of competing companies, especially in a segmented system in which various components of the value chain optimize their position without viewing the whole chain (such as choose cheap packaging materials that do not prevent damage further up the value chain), is important, but difficult. The success of associations and institutes around the world with promoting packaging can be instructive. The world map below (Figure 8) shows countries that have developed an institute for packaging, food institute, or both. Food is included because it is the largest user of packaging materials, all economies begin with agricultural products, and no other item is consumed at a level approaching three times per day for a significant sector of the world population.

Figure 8: World Map of Packaging and Food Institutes



The country institutes represented above are members of the World Packaging Organization (WPO) and/or the International Union of Food Science and Technology, each of which represents over 60 countries. Every developed country and many developing countries have packaging and/or food institutes.

B1. Objectives

The following Mission and Objectives were offered by the President of the Institute of Packaging Ghana after he heard of possible interest in Azerbaijan.

Mission: To promote the recognition of packaging as a profession, through professional training, advisory services, and establishment of standards.

Objectives:

- Inform public and customers of the benefits derived from effective packaging;
- Educate people in all matters relating to packaging;
- Promote status of packaging and interests of members in the field by every appropriate means;
- Establish educational standards, examinations, bursaries and certifications as may seem appropriate to promote packaging;
- Publish and disseminate educational and training information about matters relating to packaging;
- Hold conferences, exhibitions, seminars and other functions related to promote packaging;

- Affiliate with other experts and food/packaging institutes;
- Encourage research; and
- Serve as a forum for discussion and exchange of knowledge of packaging.

B2. Actions

Month1: Contact key suppliers and packaging users to assess interest and explore mutual benefits.

Month 2: Prepare a list of packaging users, suppliers and other interested parties (such as universities[8]) to support this collaboration and list benefits and concerns. Invite a speaker to present how such collaboration is beneficial.

Month 4: Schedule a workshop with the invited speaker to initiate the association or institute. Establish contact with other packaging institutes.

Months 4-5: Develop goals, benefits, objectives for the institute.

Months 6-9: Define an informal association, or develop a constitution for, and incorporate as not-for-profit institute with suitable interest.

Month 10: Organize a standards committee of uses and suppliers to begin recording what is available and what is desirable from both standpoints.

Month 12: Interface with other institutes.

Month 14: Inauguration of an office for the association or institute with an administrator. This step could include a celebration and seminar program.

Month 16: Submit standards from committee to the organization.

Month 18: Approve voluntary standards and organize a conference with presentation of standards and impact.

The above timing is presented in the Gantt chart.

B3. Benchmarks

The Institute of Packaging Professional (IoPP) in the US has approximately 5,300 members, offers seminars and awards programs, and has chapters nine regional chapters. Their website is www.iopp.org

The Institute of Packaging Ghana (IoPG) began with 10 members consisting of 7 packaging companies, 1 major user (Unilever), 1 professor and 1 marketing firm. Their office opened April, 2004 and they now have 50 members including packaging suppliers, converters, users, academics and individuals. Funding includes annual membership fees and donations from corporate bodies. IoPG has a 7 member board elected to 2 year terms. They have one person to run the office as a full time coordinator paid by the institute. They now have 4 standing

[8] Universities offer technical expertise and facilities. The Azerbaijan State Agricultural Academy is the only state school offering university level degrees in agricultural studies. Mirdamat Saigov is the Rector.

committees: Education & R&D, Finance, Membership, Industry and Public Relations. Reported accomplishments include:

- Contributions to national economic growth;
- Research into new and effective packaging to meet local needs (with local universities);
- Established links with international packaging bodies to be abreast with trends in industry and technology transfer;
- Increased exports arising from improved product presentation through effective packaging;
- Assisted industries, especially SME to develop cost effective and good quality packaging to make their products competitive on the international market;
- Spearheaded programs aimed at minimizing the environmental impact of packaging (necessary if you wish to open trade with EU countries);
- Supported development of appropriate packaging for handling, storage and distribution of food crops to minimize post harvest losses; and
- Involvement in formulation of appropriate national packaging standards.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Initiate a Packaging Institute	Mostly volunteer + funds proportional to activities	ASAP	18 months	Quality, trained people, competitiveness against imports, international exchange	Improved skills and efficiency, facilitate IIA4 and IIA5

C. Cross-Sectoral Support: Building Competitiveness

Virtually all developing countries posses a combination of packaging capabilities with companies that range in sophistication from fundamental producers offering packaging with no defined attributes to producers offering packaging materials that comply to international standards. While transitioning economies, such as Azerbaijan, first focus on developing their agricultural sector to feed the population prior to developing other sectors, the report and action plan will concentrate on packaging for the agricultural sector.

However, the entire packaging sector will benefit through an exchange of ideas, and through building of voluntary standards that build confidence in packaging suppliers and purchasers of their products. These result from better definition of packaging capabilities and properties and a reduction of "surprises" (unexpected failures) that can seriously erode confidence, and subsequently sales, of specific packaging materials. The actions, therefore, **include the development of a packaging institute or association.**

Packaging serves multiple functions including containment, protection and marketing. Many companies in developing countries, as well as small companies in the developed world, often consider packaging as an expense that must be minimized and fail to consider the marketing

potential. This action plan will therefore include a discussion on branding and its impact on stated concerns during several sector interviews.

C1. Branding of Azerbaijani Produce

A concern that was expressed in multiple interviews was that Azerbaijani fruits and vegetables are perceived in foreign markets (particularly Russia and CIS) to be superior to other imports. However, the fear is that a conversion from wood crates to corrugated shippers could compromise the ability of prospective buyers to recognize Azerbaijani products. A specific example was for a prospective buyer viewing corrugated containers from a distance and not approaching the seller (in the export country) for a closer look. This argument suggested benefits for wood crates, which are characteristic of Azerbaijani fruits and vegetables exports.

A complicating factor relates to a reduction in wood crate production due to government regulations to limit destruction of forests and reduce negative environmental impact. The concern is a switch to corrugated would remove that point of differentiation. Furthermore, produce is sold by total weight instead of net weight, so the wood essentially raises the price of the goods sold. The ban on wood will raise the price of wood crates, but it is anticipated that personal financial gain on the part of traders will not eliminate the trade.

The above suggests that a corrugated replacement for wood must contain an easily recognized point of differentiation. A well designed Azerbaijani logo could be developed and boldly printed on corrugated produce containers to add this point of differentiation. If box stamps are employed on corrugated shippers (see IVC3 below), the printing operation would already be included in the box manufacture at minimal cost (additional ink).

A complicating factor with this proposal is that the benefits of an Azerbaijani logo could only be optimized with cooperation of the box makers (including the corrugated manufacturers that also produce shippers) and the users/growers who order corrugated shippers. GOAJ approval is likely to be necessary and, indeed, the government should be an active player in this branding effort. The logo could be incorporated into specific company designs (such as the pre-printed shippers of Az-Rus Dostlug – presented in section IIA4 above), with maximum benefit being derived from a common color (which could be black or any color that is used on most printed shippers) and a common location.

Cooperation of producers and users is promoted through an organization of packaging producers and users, and creation of such an organization is presented in section IVD below.

Cost benefits, sales and timing is difficult or impossible to predict. For chart presentations, the assumptions are hiring two graphics artists, part time, to develop the logo, allowing industry cooperation with the creation of the Azerbaijani packaging institute (18 months), allowing 6 months to incorporate an approved logo into corrugated printing, and a modest sales increase of 2% more corrugated, mostly gleaned from wood crate sales that are expected to decline. The design processes could begin after cooperation within the industry chooses this path.

C2. Set Specifications and Standards for Corrugated

As discussed in section IIB1, designations of poor quality can result from many reasons. A corrugated board that does not meet the minimum standards for that board would be designated as poor quality. A board that meets all compliance specifications, but is insufficiently strong to satisfy its intended application may also be perceived as poor quality, but the fault lies with choice of the wrong board for the specific purpose. The third miscommunication example is the choice of the correct board that meets all specifications but is used under conditions that deteriorate board quality, for example high humidity conditions in cold storage. The solution to this problem is to either specify a stronger board such that the degradation in high humidity does not reduce properties below a critical level, or to specify a coated board that reduces the impact of high humidity.

One way to address the problems is to prepare corrugated board to standard specifications, and build a means to specify and verify that a particular shipping container is prepared and constructed with these specific qualities.

This approach solves difficulties with knowing and comparing one board or shipper with another – both in Azerbaijan and hopefully (if the same standards are used) with competitive imports. The other side of the problem is assuring that the specified board is correct for the task.

It is in both suppliers' and users' interests to: a) develop standards for corrugated board; b) design a mechanism through which the board properties may be communicated; and c) establish guidelines to specify a suitable corrugated board such that failures are reduced. This action would also make Azerbaijani companies more competitive with imports and prepare them for future expansion.

The solution is to consider standards, (explored in section IVCiii) and convey those standards to the perspective buyer. One means of conveyance is contractural. For example, Azersun supplies shipping containers to Bak-PET. Both of these companies have sufficient amount of product involved that they cannot afford a packaging failures. There is an understanding between these companies that Azersun will supply a shipping container that will not collapse under the conditions of use by Bak-PET, and/or Bak-PET specifying a minimum performance standard that Azersun's packaging must meet. The specification can be performance or construction.

Companies with less volume and fewer technical employees may or may not make similar arrangements. If they just purchase shippers of a specified dimension, adequate performance could be neither assured nor consistent; making the designation method prudent for both the protection of producer and user.

One method is to specify a product code that identifies a particular construction of performance. This solution does not provide for comparative shopping, but does address consistency.

Another method is one employed by box makers in the US. A box certification stamp[9] is printed on shippers that designates the manufacturer and a defining characteristic of the board, usually the Mullen burst value or the Edge Column Crush value. Inclusion of this stamp protects both producer and user and facilitates expanding trade to the EU and the United States. It also raises the board to international standards if international standards are used for the stamp.

Box stamps for corrugated containers are recommended. Technical assistance may be offered to identify the format for such stamps for various countries and regions, for example the US and EU, along with the testing requirements for verification of the claims. An example of a boxmakers certification stamp is presented in the next section.

As with the logo design in the previous section, cost benefits, sales and timing is difficult to predict. For chart presentations, the assumptions are zero hires as the standards and boxmakers designation will likely result from a volunteer committee within the proposed packaging institute. Allowing 18 months for the creation of the Azerbaijani packaging institute and 6 months to incorporate an approved boxmakers designation for shipping containers, total time is 24 months. Sales increases would be based primarily from capturing business currently supplied by imports and is conservatively estimated at 5%. The actual boxmakers designation symbol can be designed or chosen concurrently with the development of the packaging institute and the standards committee.

C3. Reduce Damage of Produce Transported in Corrugated

Reducing damage of products transported in corrugated containers is directly related to the discussions in sections above. The box makers certification stamp or an alternate designation declares a board's construction (grammage of liners and fluted medium, flute) or performance, or both. Typical performance measures are Mullen burst which measures that ability of corrugated board to reduce side impact, and Edge Column Crush Test (ECT) which provides an index of stacking strength.

The Mullen burst specification includes a designation of the construction of the corrugated board. An example of the box manufacturer's certification stamp with the Mullen test values is:

This example designates a single wall corrugated structure with a burst strength of 200 pounds per square inch (14 Kg/cm^2). This test board is made from linerboard with combined weight of facings of 84 pounds per 1000 ft^2 (42 for each liner), and is capable of holding up to 65 pounds of product (29.5 Kg) with a size limit of 75 inches (190.5 cm). The size limit (sometimes called the maximum outside dimensions) is obtained by adding length + width + depth.

[9] It deserves mention that boxmaker certification stamps are not legally required. The protection they offer the producer is that damage that occurs during shipment is paid by the carrier (the transporting company) rather than the shipper (the company that ships the product – usually the manufacturer, or in agricultural circumstances, the grower) if the shipping container is certified to be appropriate for the task. The corrugated manufacturer therefore has a benefit, as does the user.

The values presented in the manufacturer's certification stamp have been tested by standards organizations with simulated conditions including drop, vibration and inclined impact (simulating rail car coupling).

An alternate performance criteria is ECT. This measure is related to the stacking strength of the corrugated board, which is the primary concern for stacked and unitized products (such as those banded or stretch wrapped onto a pallet) for which impact is less likely than collapse from the weight above. An example of the manufacturer's certificate with ECT values is:

This certificate presents a single wall corrugated board with a 32 pound per inch ECT which is roughly equivalent to 200 Mullen in terms of stacking strength, but not in terms of impact strength. The ECT measure allows manufacturers to guarantee stacking performance in terms of the ECT value, but does not restrict the construction to obtain that value. It therefore gives the manufacturer more choice in construction. Mullen and ECT are not equivalent and mixed load shipments (not uniform shippers in unitized pallets) are better protected with Mullen test boards.

Both of the box certificates include the name of the manufacturer and manufacturer's location. The above specifications also include construction (combined weight of facings with a relatively standard fluted medium (usually 26 pound semi-chem), and performance (Mullen or ECT) specifications. Translating these values into performance specifications for the user is based on the Table 6 below.

The table shows that choice of liners (related to Mullen values) influences the corrugated performance, and that heavier weight liners on a single wall corrugated can be stronger than thinner liners on double wall corrugated. Packaging suppliers and users in Azerbaijan can decide to adopt the above standards or other standards, but matching corrugated characteristics to performance criteria will reduce damage from use of under-specified board, and will make Azerbaijani corrugated more competitive with imports from Iran and Turkey.

Table 6: Linerboard Performance Standards

Max Wt. Box/Contents (lbs.)	Min. Burst Test Single/Double Wall (lbs. per sq. in.)*	Min. Edge Crush Test (ECT) (lbs. per in. width)
Single Wall Corrugated Boxes		
20	125	23
35	150	26
50	175	29
65	200	32
80	250	40
95	275	44
120	350	55
Double Wall Corrugated Boxes		
80	200	42
100	275	48
120	350	51
140	400	61
160	500	71
180	600	82
Triple Wall Corrugated Boxes		
240	700	67
260	900	80
280	1100	90
300	1300	112

* Minimum puncture test, Triple Wall board (in. oz. per in. of tear)

The European Federation of Corrugated Board Manufacturers (FEFCO – from French) has set standards for efficient logistics by standardizing a Common Footprint (CF) for shippers of 600 x 400 mm and 400 x 300 mm. These dimensions are based on the Europallet and reported to be capable of reducing supply chain costs by 28%. The US also has Common Footprint recommendations (designed for a relatively standard pallet defined by the Grocery Manufacturers Association), but EU standards are mentioned because they utilize metric units. The Az-Rus Dostlug shipper described above (imported from Turkey) meets CF recommendations.

Unitization, which refers to preparing a pallet load of shippers such that shippers cannot easily move on the pallet or fall off the pallet, also reduces product damage. This is accomplished by interlocking pallet patterns (as compared with column stacking), using a tack adhesive between shippers, using corner protectors, stretch wrapping, and/or banding. All of these techniques were observed in Azerbaijan.

Matching packaging specifications to product performance and reducing product damage can have a substantial impact on the decision to purchase imported shippers or use Azerbaijani products. Quantifying this impact is difficult and, as motioned in the two previous sections,

directly related to the formation of a packaging institute or association unless the industry chooses to adopt international standards.

For chart presentations, the Director for the packaging institute (see discussion on the Institute below) could be a designated coordinator to promote the advantages of packaging performance standards to reduce transportation damage and improve competitiveness of Azerbaijani packaging. The chart below therefore includes 1 hire and a salary of 20,000 AZN. With seminars and meetings to bring these advantages to producers and users during the consideration of the packaging institute, it is reasonable to place the timing of 24 months, similar to the previous two sections.

Sales increases can be anticipated as confidence in the Azerbaijani packaging industry increases with proven performance advances for packaged products. This confidence will increase with growth of the packaging institute and with the awareness of benefits of packaging that follows the institute objectives. The sales increase is estimated at 8%.

C4. Waste Management

Wood crate, corrugated manufactures and box makers generate significant quantities of wood and corrugated waste that they burn at no cost to their companies, but at significant costs of resources (cellulose fibers) and to the environment, with no benefit to their respective companies or the industry.

Environmental Damage: One wood manufacturer alone reported generating 150 tons of wood chips per month. Estimate this waste level across wood crate sector (2 large manufacturers and 20 to 25 small crate manufacturers) and you get between 300 to 400 tons per month. Burning this waste generates 440 to 550 tons of CO_2 per month or 5280 to 6100 tons CO_2 per year. (-CHOH- + O_2 -> CO_2 + H_2O so 30 molecular weight is oxidized to 44 molecular weight). While it is unlikely that CO_2 emissions will be a major concern for Azerbaijan in the immediate future, this also represents a substantial loss in fiber resources that could be employed in development of useful products, including enhancing the corrugated industry in Azerbaijan.

Recycling Resources: The use of wood chips for corrugated manufacture is explored in section IVB1 above. The large wood crate manufacturer with chipping function that generates 150 ton wood waste per month recognizes that this waste could generate income, and have proposed adding a manufacturing line to do so, described in IVA2ii above.

Corrugated waste is handled in different ways by the corrugated manufacturers. Azersun, the largest corrugated producer in Azerbaijan is reported to recycle their own waste corrugated, and is considering collection and use for post consumer corrugated waste. Their proposal is for a paper manufacturing facility built to use of recycled industrial and post consumer corrugated and paper waste to produce corrugated is discussed in section IVB1 above.

Other corrugated manufacturers and boxmakers generate waste that is often burned rather than pay for other disposal. The annual estimate of 5.6 million boxes produced for agricultural use by other manufacturers than Azersun translates to approximately 2.3 million tons of corrugated

paperboard. With 15% waste generated within the plant (trim, die cuts, etc, and add non-box waste such as feeding new rolls into the corrugator and manufacturing waste), 600,000 tons of corrugated plant waste is estimated to be available for alternate uses. Post consumer waste also adds to this figure. Potential uses for both available wood and corrugated waste not described in sections IVA2ii and IVB1 above are discussed in section IVC4i-iii below. Yet, the list is by no means exhaustive.

C4a – Exporting waste

The investment to convert wood waste into fiberboard (section IVA2ii) utilizes the waste from a single wood crate manufacturer. However, the remaining 300 to 400 tons of wood chips generated per month, or 3600 to 4800 tons per year represents a resource that should be utilized rather than burned. Giving these wood chips to someone willing to haul them to another user represents a cost neutral change of little benefit to the crate manufacturer, but with less detrimental environmental impact (both from CO_2 generation and waste of the fibers themselves). A financial incentive would make the choice easier.

The amount of wood waste is significant, but minor in terms of production of paperboard. Paper mills that supply Azerbaijan and that are geographically close to Azerbaijan may be willing to purchase wood waste at best, or haul it at their expense at worst if the transportation costs would justify their collecting and transporting these fibers for their operation. This could also be tied to a virgin pulp source as suggested in section IVB1.

Corrugated waste offers additional options because the fibers have already been processed and can be more easily re-processed as mentioned above. The addition of the 400,000 tons of clean industrial corrugated waste would represent a resource for the paperboard plant with an easier (more limited source) collection. If the anticipated paperboard plant does not open, or if other reasons suggest not offering waste for this purpose (e.g competitive concerns), other entities seek used or waste corrugated board. The Pacific Rim, and most notably China, purchases used corrugated from the US for $25 – 45 per ton (before the current financial crisis, the price was over $100 per ton).

With 400,000 tons of clean industrial waste, this represents potential sales of $10 million per year. With an expectation to recover 10% of this waste, the sales are 800,000 AZN. The investment of time and communication costs to identify buyers is essentially zero. Employment opportunities exist, if companies decide that hiring a coordinator is prudent, or if 2 -3 entrepreneurs chooses to coordinate corrugated collection from multiple companies. If we choose this latter option for entrepreneurs and allow for purchase of a truck, an investment of 100,000 AZN would be reasonable and provide two individuals to have an interest in utilizing corrugated waste.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Corrugated collection entrepreneur	100,000 AZN	Upon receipt of investment	4 months	800,000 AZN	2

Benchmark: The US corrugated industry collects corrugated board for recycling at a rate of 78%. Corrugated board in the US contains 43% recycled fiber. 35% of used corrugated is exported with the bulk going to China. With 25.6 million tons collected, almost 9 million tons are exported with a value of $224 million.

C4b – Briquette line

Another potential business for using waste wood fibers, and possibly corrugated wastes, is to manufacture heating briquettes for homes and other heating uses. The fibers are essentially extruded (in a process similar to sausage making), and cut to specific lengths.

The material must first be ground to a size between 1 and 12 mm, and have a moisture content of between 8 and 12% (reduced from a moisture content of approximately 31%, normal for softwoods like poplar). It should also be free of hard contaminants like steel, concrete, stones.

One briquetting machine that can handle 5 tons/day is the DiPiu BRIK MB60. The complete line consists of the briquette press, a feeding buffer silo, an automatic heating/cooling unit for the compression head, a cooling line, and a briquette chopper. The price of a line with a 16 foot (5.3 meter) cooling line is $ 155,600 or 124,480 AZN Ex-Works Breganze, Italy in seaworthy container. Installation and training, performed by a factory engineer, is included in price.

Briquettes vary in price with two examples 100 AZN/ton in Sweden and 130 AZN/ton from Russia (minimum quantities apply). Since this is a new market for Azerbaijan, 100 AZN/ton is used as an estimate below.

The briquette line can be operated by one person. Two additional employees are included to handle waste and the grinder.

Action	Investment	Initiation	Time frame	Sales increase	Jobs created
Install briquetting line	$182,000	Upon receipt of investment	5 months	150,000 AZN	3

D. Conclusions

In sum, good, effective, and attractive packaging is a key ingredient of a competitive agro-industry. As is the case in many emerging economies, appreciation for packaging as a basis of competitiveness is not fully appreciated in Azerbaijan. By working with key sector stakeholders, PSCEP could make a valuable contribution to this key value chain segment.

Annex A: Action Plan Timeline (Gantt Chart)

Chemonics	PSCEP: Year 1 Work plan - Packaging Sector Action Plan

A1. Support to Corrugated Sub-Sector		Year 1											
Actions	Month	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
A1a	Safari - Increase corrugated production and graphics												
a	Obtain Investment	X											
b	Order printer	X											
c	Ship printer to Batumi or Poti	X X X	X										
d	Transfer printer by rail to Guba		X X X	X									
e	Design and order printing plates			X X X X									
f	Install and Commission printer, Inspection if necessary			X X I									
g	Train staff on new printer				X X X X								
h	Commence Production					> > > >	> > > >	> > > >	> > > >	> > > >	> > > >	> > > >	> > > >
A1bi.	Azersun - Recycled Board Plant												
Plant Construction													
b	Prepare Site	X X X X											
c	Build Production Facility		X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X				
d	Build Office Buildings								X X X X	X X X X	X X X X	X X X X	
e	Build Warehouse									X X X X	X X X X	X X X X	X X X X
f	Adjust Production Line									X X X X	X X X X	X X X X	X X X X
Equipment Orders & Installation													
g	Order equipment						X X						
c	Ship equipment							X X X X					
d	Install equipment								X X X X				
h	Training staff on equipment								X X X				
i	Commence Production									> > > >	> > > >	> > > >	> > > >

Chemonics

PSCEP: Year 1 Work plan - Packaging Sector Action Plan

A3. Support to Plastics Sub-Sector		Year 1																																															
Actions	Month	Month 1				Month 2				Month 3				Month 4				Month 5				Month 6				Month 7				Month 8				Month 9				Month 10				Month 11				Month 12			
A3a	**SAF Plastics - PVC Stretch film line**																																																
a	Obtain Investment	X																																															
b	Order equipment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																
c	Ship equipment																	X	X	X	X																												
d	Install equipment																					X	X	X	X																								
e	Commence Production																									>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
A3b	**Azer Pak - Thermoform line**																																																
a	Obtain Investment	X																																															
b	Order equipment	X	X																																														
c	Ship equipment			X	X	X	X																																										
d	Order & receive resins					X	X	X	X																																								
e	Install/Commission equipment								X	X	X	X																																					
f	Inspect equipment (if needed)											X	X																																				
g	Tune equipment														X	X																																	
h	Training staff on equipment												X	X	X	X																																	
i	Commence Production																>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
A3c	**Azer Pak - Print line**																																																
a	Obtain Investment	X																																															
b	Order printer	X	X																																														
c	Ship equipment			X	X	X	X																																										
d	Order & receive resins and print plates					X	X	X	X																																								
e	Install/Commission equipment								X	X	X	X																																					
f	Inspect equipment (if needed)											X	X																																				
g	Tune equipment														X	X																																	
h	Training staff on equipment												X	X	X	X																																	
i	Commence Production																>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>

Chemonics	PSCEP: Year 1 Work plan - Packaging Sector Action Plan

B. Develop a Packaging Institute

	Actions / Month	Year 1											
		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
a	Guage Interest & find interested parties	X X X X	X X X X	X X X X									
b	Hold Meeting				X								
c	Set goals and objectives for institute				X X X	X X X X							
d	Formalize structure of institute						X X X X	X X X X	X X X X	X X X X			
e	Develop standards									X X X	X X X X	X X X X	X X X X
f	Ongoing Activities												> > > >

C. Cross-Sectoral Support: Building Competitiveness

	Actions / Month	Year 1											
		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
C1	**Promote Branding (logo)**												
a	Establish cooperation				X X	X X X							
b	Design logo					X X	X X X						
c	Introduce & promote logo among farmers / traders / etc.						X	X X X X X X					
d	Involve manufacturers								X X	X X X X			
e	Order printing plates										X X X X X		
f	Launch production runs											> > >	> > > >
C2/C3	**Establish Standards and Specifications for Corrugated**												
a	Establish cooperation				X X	X X X							
b	Establish specifications / standards					X X	X X X						
c	Convince manufacturers to identify boards						X	X X X X X X					
d	Convince suppliers/users to adopt standards						X	X X X X X X					
e	Establish certificae format for standards								X X	X X X X			
f	Order printing plates										X X X X X		
g	Launch production runs											> > >	> > > >
h	Utilize standards for orders								> >	> > > >	> > > >	> > > >	> > > >
C4b	**Briquette Line**												
a	Order equipment	X X X X	X X X X	X X X X									
b	Ship equipment				X X X X	X X							
c	Install equipment					X X							
d	Train staff						X						
e	Commence Production						> > >	> > > >	> > > >	> > > >	> > > >	> > > >	> > > >

Annex B: Companies visited by Kenneth Marsh

No.	Company Name	Contact Person, Title	Contact No.	Sector / Subsector	Date
1	Azersun Holding - Azer Tara Company	Ajdar Asgarov, Technical Director	(050) 375-39-62	Cardboard Packaging	20-Apr-09
2	Umayra Group	Fikrat Shabanov, President	(050) 212-92-89	Molded Pulp - egg packaging	20-Apr-09
3	Azer Plast	Elman Muradov, Director	(050) 215-09-43	Plastic Company	21-Apr-09
4	BAK-PET	Ilgar Vahabov, Assistant Director	(050) 208-08-32	Plastic Company	21-Apr-09
5	Abdullah Abdullayev	Abdullah Abdullayev, Owner	Guba	Wood crate maker	22-Apr-09
6	Safari	Aliyar Safibayov , Director	Guba	Corrugated Box producer	22-Apr-09
7	Rasif Mammadov	Rasif Mammadov, owner	Guba	Wood crate maker	23-Apr-09
8	SAF Plastic	Sahib Aliyev, Director	(050) 214-08-26; (012) 495-95-84; (012) 496-67-62	Plastic Company	27-Apr-09
9	Caspian International Investment Company	Samir Tagiyev, Director of Business Development and Investment department & Mahmud Jafarov, Investment Associate		Investment Company	28-Apr-09
10	Vugar" Farming Enterprise	Shakir Ghashamoglu, Director	Shamkir	Cold Storage	30-Apr-09
11		Aliyev Elman, Director	Ganja	Wood crate maker	30-Apr-09
12	Gabala LLC	Sabir Shahbazov, Director	(050) 364-34-20	Corrugated Box producer	30-Apr-09
13	Az- Rus Dostlug LLC	Mais Gurbanov, Director	Ganja	Greenhouse production	1-May-09
14	Ganja Confectionary LLC	Mahir Abdullayev, Director	Ganja	Confections	1-May-09
15	Islamoglu LLC		Ganja	Cardboard Packaging	1-May-09
16	AzerPak company	Farahim Mamedov, President & Javanshir Veliyev, Commercial Director	(012) 490-37-37	Plastic Packaging Distributor	4-May-09
17	Naval Attaché at the American Embassy	Matt Verich, Naval Attaché		Supplies for Afghanistan	4-May-09
18	El-Plastic LLC	Gulaga Abishov, President	(050) 210-22-26; (012) 448-17-71	Plastic Packaging Producer	5-May-09

Annex C: Company Information - Corrugated and Wood Crate Producers

Azersun – Corrugated Producer:
Azersun has 5 production lines – 2 for corrugated board, 3 for paperboard, with production capacity of 2000 tons per month.

This may be expressed as:
- 2.5 million m^2 of corrugated board per month
- 1.5 million m^2 of paperboard per month for
- Total, 4 million m^2 per month = 2000 tons per month.

While agricultural demand has increased over 300% in the past two years, the current economic downturn has resulted in decreased production by 30 to 40% and current production is 1200 tons per month. They produce both single and double wall corrugated board.

Corrugated containers usage is:
- 20-25% for agricultural products,
- 10% for poultry,
- 10% for furniture, and
- the rest for other uses including processed food, beverages and other products.

Translating the above manufactured board capabilities into the number of corrugated shippers supplied to the agricultural sector is as follows:
- The most common shipper used for agricultural produce is reported to be the 400 x 300 x 140 mm shipper. This size matches the European CF (common footprint) standards of 400 x 300 mm and 600 by 400 mm that are designed to fit Euro-pallets. Imported shippers from Iran and Turkey also meet these standard.
- The blank to prepare this shipper is 550 x 755 mm or 4152.5 cm^2. Assuming the most ideal layout, 2.4 boxes can be made from each m2 of corrugated board.
- If we apply 20% to compensate for larger shippers, Azersun's corrugated box capacity is 1.2 million boxes per month. With production currently 60% of capacity, 760,000 corrugated boxes are available for agricultural produce per month, or 9.1 million per year.
- Azersun also makes 4000 molded pulp items per month. Molded pulp is used for apples, eggs, pears and other sensitive products.

The Azersun representative, Ajdar Asgarov, stated that their growth emphasis was to package potato and tomato in corrugated containers that are viewed to be Azerbaijani products. Early potatoes are packaged in multi-wall bags, and tomatoes are packaged primarily in wood crates. Wood crates are associated with Azerbaijani produce, and a concern was expressed that corrugated containers, typically associated with Iranian and Turkish produce, could be viewed from a distance and not attract a potential buyer of Azerbaijani produce. This concern will be addressed in the Action Plan.

The company reported that they produce to ISO corrugated standards and presented a list of standards that they reported to follow. However, a quick glimpse into their laboratory did not show much of the required equipment needed for such testing, but it could be located in another

lab. Azersun was reported to have the only corrugated testing facilities in Azerbaijan and was certified to offer testing to outside companies.

Safari – Corrugated Producer:
Safari has 2 corrugators (1 production line) – Russian made, capable of producing 150 – 200,000 corrugated boxes per month. They have 2 and 3 color printing capability and can die-cut and score to customer requirements. Their corrugated containers are primarily used for agricultural products, 80% of which are exported.

Safari works one 8 hour shift per day, but Safari's director, Aliyar Safibayov, stated that the line breaks down one or two times per day with a loss of about 20% of their production. He also stated that Safari turns away orders they cannot fill. At one point he stated that he wanted to replace the entire line, possibly with equipment from Spain or Germany, but mentioned no specific equipment. At another point, he stated that he wanted to replace the printer and die-cutter. He mentioned that his staff could keep the main line running, but that the printer was the limiting component. He suggested further that replacing the printer would allow him to run 2 shifts.

Die-cutting and trimming corrugated panels to box specifications generates significant corrugated waste. This waste is burned, affording no benefit for the fibers therein, and has an environmentally negative impact. Safari would be willing to offer this waste to alternative uses provided such action is revenue neutral.

Abdullah Abdullayev – Wood Crate Producer:
A wood crate manufacturer with the equipment to prepare slats from logs also had automated equipment to staple the crates together, with the staples made on-line from a wire feed. The company can generate 8,000 to 10,000 slats per 8 hour day and staple a crate together in about 5 seconds. The company employs 20 workers. Their output is 3 to 5,000 per day with a capacity of 1.5 million per year. However, the business is seasonal, so they make 6000 crates per day with a 10 hour day, work 5 months at 25 days per month for an annual production of 750,000 crates. The owner reported that he supplies 15 to 20% of the Guba region crates, which suggests the crate production for the Guba region is between 3.75 and 5 million crates.

Elman Aliyev – Wood Crate Producer:
One of the two larger wood crate manufacturers in Ganja. When asked for the yearly output, the director gave a range of 50 to 60,000 crates. This manufacturer employed youth to manually construct crates on a piece work pay scale of 0.10 AZN per crate. Each person makes 100 to 150 crates per day and 15 workers are constructing the crates. The daily output is therefore 1500 to 2250 crates. They likely work 7 days per week, but with holidays and staggered time off, 300 days per year was used in the calculation. The yield is 450 to 675,000 crates per year. It is unlikely that the maximum production of crates per worker could be maintained, so a count of 500,000 crates per year will be used. The discrepancy between the reported and calculated output appears to favor the higher count. It is possible that the reported output is understated to reduce the VAT tax burden of 18% on finished crates. Based on this estimate, the estimated production for Ganja—including two large producers and 20-25 small manufactures—is approximately 2 million crates for this region.

Annex D: Laminated Structure Manufacture

Because of the added potential that laminating could add to the plastics sector, laminating lines were explored. The conclusion was that this capability could not be defined through the limited duration of this study, but a summary is presented below for future reference.

Proposing a lamination line is difficult if not impossible due to the difference in size, speed, controls, quality, types of materials to be laminated and typical run size. If we limit the type of laminators to those used for flexible packaging material we have:

- dry bond adhesive laminators from about 18" wide to about 80" wide,
- wet bond adhesive laminators from about 36" – 100" wide,
- solventless (100% solids) laminators from 30" – 90" wide, and
- extrusion laminators from about 40" – 120" wide.

Dry bond adhesive laminators run in price from $75,000 - $300,000 for a small (18" – 40") laminator for small runs, slow speeds, little process controls and hope-for-the-best but expect-the-worst results. Larger combination laminators cost up to $10,000,000 USD. The cheaper equipment is usually limited to third world countries as this equipment cannot compete in the U.S. or Europe. Most food flexible packaging convertors in the U.S. will be using dry bond adhesive laminators from 40" – 80" wide costing $1,000,000 - $5,000,000. Dry bond adhesive laminators are suitable for film-to-film laminations, film-to-foil-to-film. The cheaper equipment will not handle foil laminates.

Wet bond adhesive laminators are typically used for paper or board and are not suitable for film-to-film or film-to-foil laminations. Solvent-less adhesive laminators are expensive and not suitable for most converters in third world countries.

Extrusion laminators are expensive, wide, high speed, and not suitable for short runs. 33,000 square meters is considered a minimal quantity for small run. Some applications require a 100,000 square meter minimum.

Entry into the laminating capabilities would most likely be with a low cost dry bond adhesive laminator. Much of this equipment is produced in Taiwan. This equipment is not normally used in the U.S. due to lack of control and quality.
In addition to a laminator, slitters, mixing equipment for adhesives, solvent storage, roll grinders, and other related equipment are required to complete the line. Printing requires printing presses, mounting equipment, ink mixing equipment, plate making, etc.

This analysis will conclude with a comment on investment potential. The issue of cost and profitability are extremely difficult to address. For instance with high speed, expensive laminators, a convertor must run at least three (3) shifts five days a week or 24/7 to be profitable in the flexible packaging food business. Typical profit levels for adhesive laminators are normally 2-4% if running 24/7.

Following this analysis, it was decided to enter it here and not include it in the action plan which is restricted to investments with jobs and sales generated within three years.