



Food Security Sector Working Group Meeting

10/02/2017

***Chambers of Commerce, Industry and
Agriculture***



Agenda



1. LCRP 2016 End of year achievements
 2. LCRP 2017 :sector targets vs partners targets and gaps
 3. WFP updates on hotline and price monitoring
 4. Prevention of apples' post harvest losses in Lebanon (MoA/FAO)
 5. AOB
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FOOD SECURITY SECTOR ACHIEVEMENT 2016

OUTCOME 1: Food Availability

of vulnerable people reached with in-kind food assistance

● 213% | 107,105

% of farmers with enhanced farming production

● 23% | 5,311

OUTCOME 2: Food Accessibility

% of vulnerable people reached with cash based food assistance

● 87% | 773,641

Amount of cash for food transferred through vouchers, ATM cards and e-cards

● 67% | \$222.9 M

of individuals reached with food assistance (all modalities)

● 94% | 880,746

FOOD SECURITY SECTOR ACHIEVEMENT 2016

OUTCOME 3:

% of individuals supported with nutritional practices
(training + gardens)

● 132% | 13,200

OUTCOME 4:

of national institutions involved in food security
supported

● 120% | 6

of national institutions staff trained

● 56% | 277

What went well

Key achievement and impact against SO of the LCRP

- **Up to 880,746 individuals** reached through different types of **food assistance** representing the 95% achievement against the sector established target
- The food assistance provided has helped stabilize the situation – ensuring poor and food insecure families **can meet their basic food needs**.
- **Funding for job creation activities increased** during Q2 and Q3, leading to the start of job creation in Q4 in the agriculture sector (asual and seasonal labour)
- **Support to government/national institutions** was provided mainly to the Ministry of Agriculture offices (7), centers (30) and technical schools (7) and Ministry of Social Affairs Social Development Centers (SDCs)
- Support to integration of **social protection for farmers** through initiation of the establishment of farmers' registry
- Conducting **several studies on food security** and related topics: VaSyr 2016 (WFP-UNICEF-UNHCR: published); Child Labour in Agriculture in Bekaa (FAO-UNICEF-ILO: ongoing); Agriculture Production Survey (FAO: ongoing); Child Labour in Agriculture – demand side (FAO-UNICEF: ongoing)

Challenges

The sector witnessed an increase in funds directed to supporting Lebanese farmers and the agricultural sector after quarter 3 of 2016.

Due to the nature of the interventions, the progress and the impact of such responses is expected to be more visible and tangible in the upcoming years to follow.

Key Priorities and gaps

- Based on the current food security situation sector priorities remain:
 - Provision of direct and critical food assistance (through cash-based transfers for food and also in-kind assistance where appropriate) in support for highly vulnerable groups;
 - Promote agricultural investment to improve agricultural opportunities for Lebanese small-scale farmers to protect their assets, stabilize their livelihood opportunities and enhance long term competitiveness; and to create adequate job and livelihood opportunities for men and women;
 - Support national and local food security systems, including social safety nets' capacity building and social protection to promote stabilization.

- Shifting of interventions since 2015, moving from direct humanitarian assistance to medium stabilization interventions: overall sector needs for stabilization have increased from 14% of total needs in 2015, to 27% in 2016 to 32% in 2017

The sector has high recurrent needs, with some \$20 million a month needed for the core food assistance to displaced Syrians.

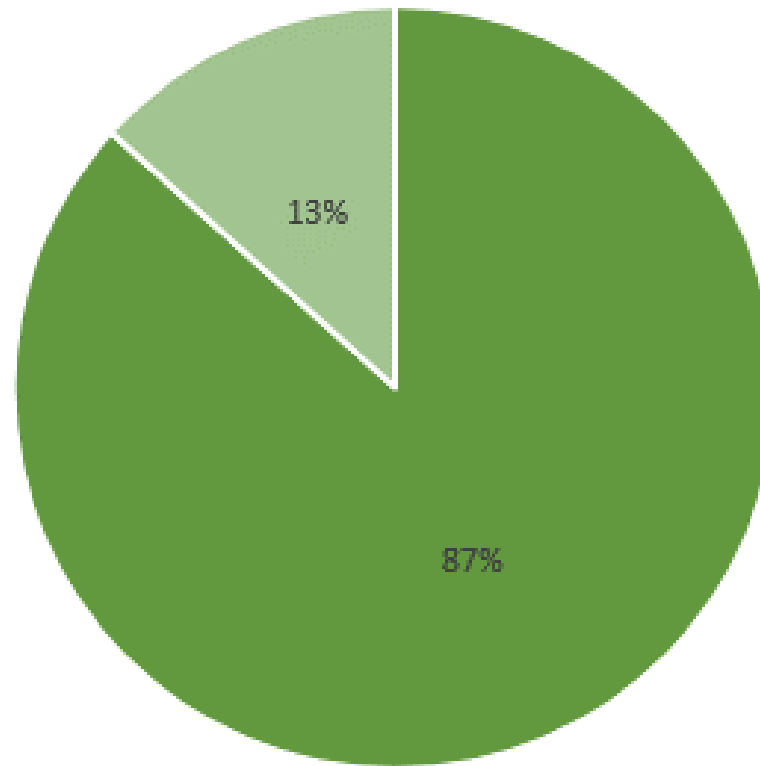


LCRP 2017 UPDATES



appealing partners: 30 (excluding MoA and MoSA)

of reporting partners: 26





LCRP 2017: *Food Assistance Targeting*

Cohort	Sector Target (individuals)
Displaced Syrians	837,207
Vulnerable Lebanese	71,001
PRS	31,502
Total	939,710

Cohort	CASH %	In kind %
Displaced Syrians	95%	5%
Vulnerable Lebanese	85%	15%
PRS	100%	
Overall Total	95%	5%



Targeting – For In Kind Food Assistance



In Kind Food Assistance - 2017 Targets and Gaps

Breakdown By Cohort	PRS			Displaced Syrians			Vulnerable Lebanese			PRL	Total
	Sector targets	Partners targets	GAPs	Sector targets	Partners targets	GAPs	Sector targets	Partners targets	GAPs	Partners targets	
Akkar	-	579	(579)	3,830	10,860	(7,030)	1,000	717	853	1,579	4,830
Baalbek-El Hermel	-	3,728	(3,728)	4,820	21,315	(16,495)	500	147	240	728	5,320
Beirut	-	164	(164)	994	910	84	500	260	(1,151)	94	1,494
Bekaa	-	110	(110)	9,245	20,463	(11,218)	2,000	1,651	1,808	110	11,245
El Nabatieh	-	96	(96)	1,756	672	1,084	500	192	(1,917)	96	2,256
Mount Lebanon	-	89	(89)	10,574	4,990	5,584	2,000	2,417	1,090	149	12,574
North	-	20	(20)	5,940	14,010	(8,070)	2,560	910	2,560	60	8,500
South	-	2,520	(2,520)	2,840	5,220	(2,380)	1,940	-	(4,354)	60	4,780
Total	-	7,306	(7,306)	40,000	78,440	(38,440)	11,000	6,294	(871)	2,876	51,000

The targets submitted by partners on Activity Info, are than the official targets due to inclusion of “seasonal or one off” additional activities, which provides food parcels for e.g. Ramadan or winterization and school feeding

Coordination with UNWRA should be initiated



Targeting – For In Kind Food Assistance



Breakdown By Cohort	PRS		
	Sector targets	Partners targets	GAPs
Akkar	-	579	(579)
Baalbek-El Hermel	-	3,728	(3,728)
Beirut	-	164	(164)
Bekaa	-	110	(110)
El Nabatieh	-	96	(96)
Mount Lebanon	-	89	(89)
North	-	20	(20)
South	-	2,520	(2,520)
Total	-	7,306	(7,306)



Targeting – For In Kind Food Assistance



	Displaced Syrians		
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Targeting – For In Kind Food Assistance



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Mount Lebanon	2,000	2,417	1,090
North	2,560	910	2,560
South	1,940	-	(4,354)
Total	11,000	6,294	(871)



Targeting – For In Kind Food Assistance



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Coordination with UNWRA should be initiated

**Includes School snack*



Targeting – For Cash Based Food Assistance



Cash Based Food Assistance - 2017 Targets and GAPS

Breakdown By Cohort	PRS			Displaced Syrians			Vulnerable Lebanes			PRL
	Sector targets	Partners targets	Gap	Syrians**	Partners targets	Gaps without SF	Lebanese	Partners targets	Gaps	Target PRL
Akkar	2,032	2,032	-	87,159	81,511	5,648	25,710	23,216	2,494	
Baalbek-El Hermel	1,895	1,895	-	129,585	121,406	8,180	5,792	4,964	828	
Beirut	682	2,248	(1,566)	12,167	18,519	(6,352)	5	-	5	145
Bekaa	3,686	3,686	-	234,105	219,292	14,813	2,417	2,109	308	
El Nabatieh	549	549	-	35,649	33,559	2,090	54	204	(150)	
Mount Lebanon	7,005	7,005	-	146,958	142,623	4,335	1,722	1,708	14	
North	2,837	2,837	-	102,028	97,792	4,236	22,368	19,296	3,072	
South	12,816	14,382	(1,566)	49,556	48,647	909	1,933	1,576	357	145
Total	31,502	34,634	(3,132)	797,207	763,348	33,859	60,001	53,073	6,928	290

*UNWRA plan to cover the full 31, 502

** Please note that the total sector targets for displaced Syrians is based on the percentage of the FS categories calculated at Governorate level



Targeting – For Cash Based Food Assistance



Breakdown By Cohort	PRS		
	Sector targets	Partners targets	Gap
Akkar	2,032	2,032	-
Baalbek-El Hermel	1,895	1,895	-
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Targeting – For Cash Based Food Assistance



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Total	797,207	763,348	33,859



Targeting – For Cash Based Food Assistance



Breakdown By Cohort	Vulnerable Lebanese		
	Lebanese	Partners targets	Gaps
Akkar	25,710	23,216	2,494
Baalbek-El Hermel	5,792	4,964	828
Beirut	5	-	5
Bekaa	2,417	2,109	308
El Nabatieh	54	204	(150)
Mount Lebanon	1,722	1,708	14
North	22,368	19,296	3,072
South	1,933	1,576	357
Total	60,001	53,073	6,928



Targeting – For Cash Based Food Assistance



The targets submitted by partners on Activity Info, more or less matches the official sector targets agreed in November (overall and by governorate) for all cohorts.

Under / Over Targeting: For Syrians the number is a little low **but it is compensated by the in kind food assistance** but for PRS and Lebanese, the actual targets are a little higher but will allow for possible gap-filling.

Coordination with WFP (on Syrian displaced), NPTP/MOSA (on Lebanese) and UNWRA (on PRS/PRL)



Targeting – For Agricultural Livelihoods Activities



OUTCOME 1: Promote food availability

Consolidated Overview	Official Sector Targets	Actual Partner Targets	Under / Over Targeting
OUTPUT 1.2: Target (# of farmers with enhanced farming production and adoption of climate smart technologies)	21,693	6,473	15,220 (mainly in Mt Leb & Nabatieh)
OUTPUT 1.3: Target (# of farmers/producers supported for access to markets)	5,423	2,252	3,171 (mainly in Mt Leb)



Targeting – For Agricultural Livelihoods Activities



OUTCOME 2: Promote food accessibility

Consolidated Overview	Official Sector Targets	Actual Partner Targets	Under / Over Targeting
OUTPUT 2.2: Target (# of national agricultural institutional sites: MoA offices/centers/schools supported)	45	92	47, same institution by different partners (mainly in North & Mtl Leb)
OUTPUT 2.2: Target (# local agricultural associations supported/created eg: cooperatives, farmers groups...)	50	197	
OUTPUT 2.3: Target (# of farmers supported financially and technically for private agriculture investment)	5,423	2,095	3,328 (mainly in Mt Leb)
OUTPUT 2.4: Target (# of SUPPORTED FOR EMPLOYMENT in the agriculture sector-education)	1,155	5,615	4,460 (mainly Akkar)
OUTPUT 2.5: Target (# employed in the agriculture sector)	10,000	38,740	28,740 (mainly Akkar)



Targeting – For Agricultural Livelihoods Activities



OUTCOME 3: Promote food Utilization

Consolidated Overview	Official Sector Targets	Actual Partner Targets	Under / Over Targeting
OUTPUT 3.1: Target (# of PRS for improved nutritional practices)	35,000	27,956	7,044 (mainly in the south)
OUTPUT 3.2: Target (# of SYR trained/awareness of food safety related issues)	5,423	25,690	20,267 (mainly Bekaa)

OUTCOME 4: Promote food Utilization

Consolidated Overview	Official Sector Targets	Actual Partner Targets	Under / Over Targeting
OUTPUT 4.2: Target (# of National Staff Trained)	500	716	216



WFP HOTLINE and PRICE MONITORING



JOINT HOTLINE

From 2013- 2016 WFP operated hotlines through its Cooperating Partners in the field (9 in 2016)

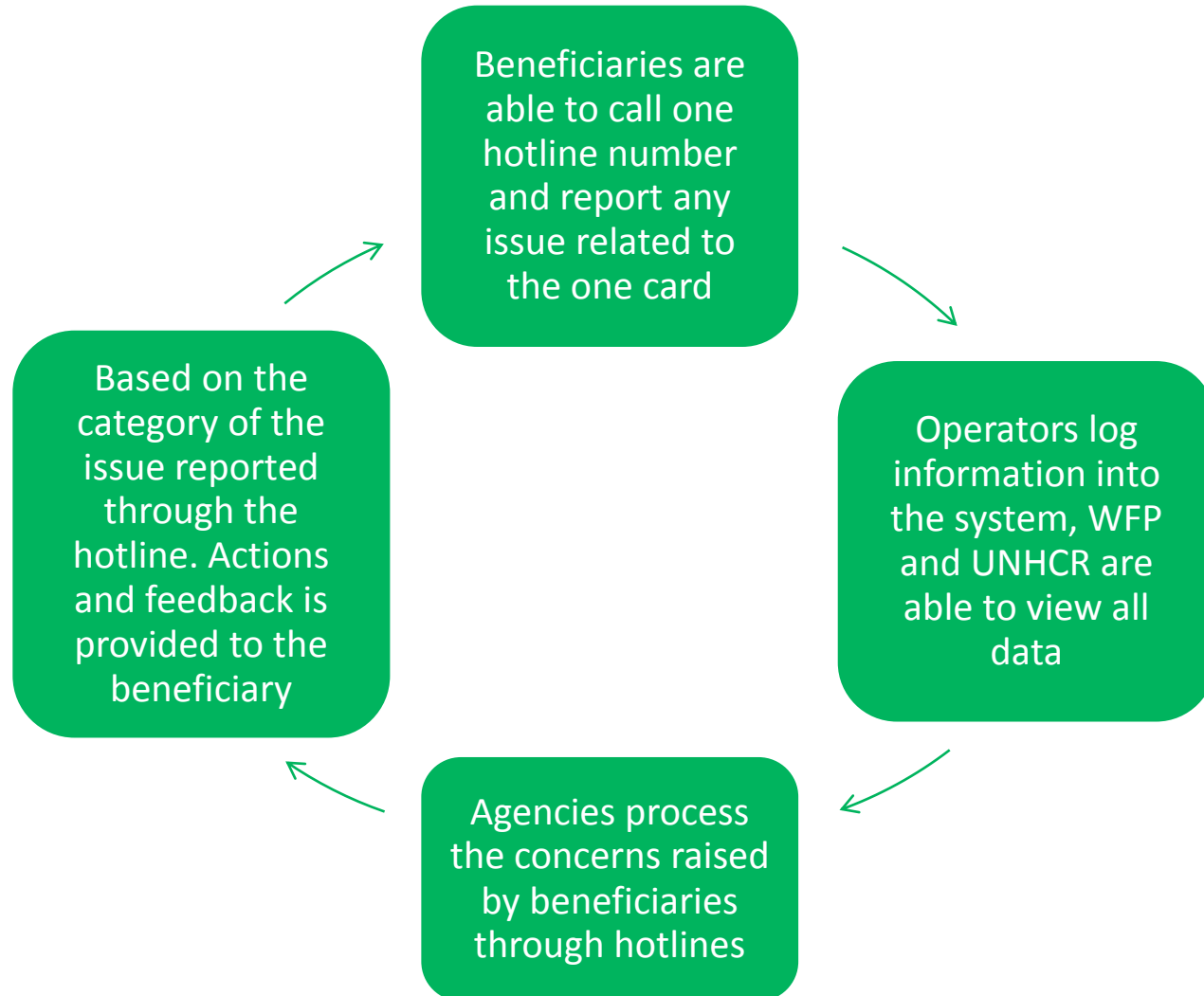
Discussions on a common hotline between different agencies started in mid-2016

With the launch of the common card and the Lebanon One **Unified Inter-Organizational System for E-cards (LOUISE)** a common hotline became imperative.

While a fully-fledged hotline for the common card Agencies is expected to be operational in April, WFP joined the winterization call center operated by an external company as an interim solution.



How it works?





PRICE MONITORING



In 2015 and 2016, WFP conducted regular price monitoring using shop and market visits (contracted and non-contracted shops)

In 2016, WFP started receiving information on the prices of food commodities purchased by the beneficiaries from contracted shops

This new source of information provided WFP with a wealth of price data which led to the discontinuation of the visits for price monitoring and to focus to core tasks for programme quality.

Few items (vegetables) which are difficult to capture through the established system are monitored through regular monitoring visits.



Prevention of apples' post harvest losses in Lebanon



الجمهورية اللبنانية
وزارة الزراعة



Capacity Building for Food Loss Reduction in the Near East”

TCP/SNO/3501

National Project Coordinator
Nadine Abdelkhalek
NPC assistant
Vicky Gebrayel

FAO's Strategic Objective 4 (SO4), "Enable more inclusive and efficient agriculture and food systems at local, national and international levels"

output 2.2 "Evidence-based food loss and waste reduction programs are developed at national, regional and global levels"

output 2.3 "Governments and relevant stakeholders are provided with support to promote inclusive, efficient and sustainable agro-food value chains".

FAO's Strategic Objective 1 (SO1), "Contribute to the eradication of hunger, food insecurity and malnutrition", by increasing the availability and quality of food in the four countries through increased capacity to achieve efficiency in food value chains, and reduce food losses and waste.

Lebanon: This project is aligned with two of three priority areas in the FAO Lebanon CPF for 2012-2015

CPF Priority Area A: Ensuring availability of safe and nutritious food and strengthening national capacities for improved food security

CPF Priority Area B: Fostering agricultural production, increasing competitiveness and improving food systems and livelihoods.

Project Goals:

Strengthen national capacity of local leaders and managers in the food industry, and extension personnel in the sub-region, on improved value chain management.

Output 1 . Constraints of the food chain in the Near East Region are better understood

Activity 1.1. Carry out a comprehensive review of the present status of the fresh and processed foods sector in each of the four countries, to inform the specific activities proposed to achieve the decided outputs.

Activity 1.2. Conduct a training needs assessment for target audiences in each country for the different food sectors

Output 2. Awareness of the negative impacts of food losses and waste is raised among organizations, managers and agricultural extension agents

Activity 2.1. Develop visual aids (posters, charts) illustrating improved practices in reducing food losses and waste for key commodities in the Middle East, for use at the 4 in-country workshops, and for trainees to re-use in their respective training activities.

Output 3. Capacity of target beneficiaries in food loss and waste reduction in the region is strengthened and improved

Activity 3.1. Design the curriculum

Activity 3.2. Prepare training materials on food loss and waste reduction.

Activity 3.3. Provide target beneficiaries with a Food Loss Prevention Tool Kit

Target beneficiaries

Leaders of organizations representing,

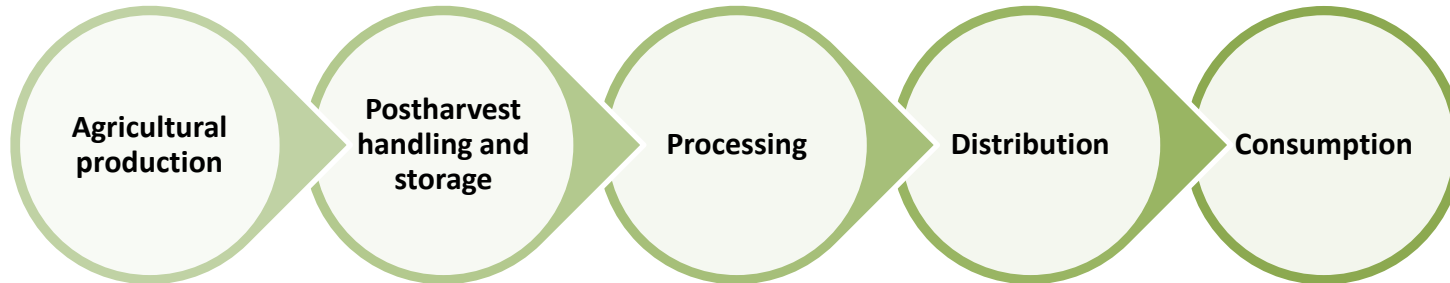
- 1) farmers and marketers of horticultural crops
- 2) producers and marketers of dried products of plant origin
- 3) livestock and dairy producers and marketers
- 4) fisheries operators
- 5) consumers

Managers of,

- 1) packinghouses and abattoirs
- 2) cooling, freezing and cold storage facilities
- 3) drying, fumigation, and storage facilities for dried products of plant origin
- 4) transport services for perishable foods

Food Loss and Waste (FLW): Key terms

Food supply chain: The connected series of activities to produce, process, distribute and consume food.



Food Loss: The Edible parts of plants and animals intended as **food for humans**, but **not ultimately consumed** by people. It represents a **potentially avoidable** decrease in the mass, caloric or nutritional value of food. Food loss can be **quantitative** or **qualitative**.

FL results from managerial and technical limitations in harvesting techniques, storage, processing, transportation, and marketing systems.

Food Waste: caused mainly by consumer behaviour, customs and habits, retail practices, and inadequate policy and regulatory instruments such as subsidies and standards.

Definitional Framework of Food Loss, FAO 2014

available from <http://www.fao.org/save-food/info-resources/en/>

Capacity building training

- More than 30 extension agents participate to a training workshop on preventing losses in the apple supply chain that was held from 15th Nov to 18th Nov 2016 in Movenpick hotel Beirut in addition to a field visit to the Beirut wholesale market & Liban village (cold store and packing site)
- The agents had to conduct their own training mission afterward for 10 or more trainees that are of concern to postharvest and/or food loss .

Trainings performed till today

25 trainings :

Akkar: Kobayat , Abdeh ,

North: Zgharta , Tripoli ,

Mount Lebanon : Ehmej , Jbeil , Bkaatouta ,
Kfardebian , Bikfaya , Jbeh , Deir el Kamar , Jwar el
Hoz ,

Bekaa : Taanayel

Baalbak el Hermel : Jaboule

South : Jbeh , Khiam

358 stakeholders trained

The main objectives of applying postharvest technology to harvested apples are:

- **Maintain quality of apples**
- **Maintain quality attributes for apples**
- **Ensure food safety**
- **Reduce post harvest losses**

Bad postharvest practices often Lead to quality deterioration and significant economic losses.

Post-harvest losses causes:

- **Trading wrong**
- **bad packaging**
- **lack of necessary equipment**
- **not to deal Carefully**
- **lack of trained workers.**

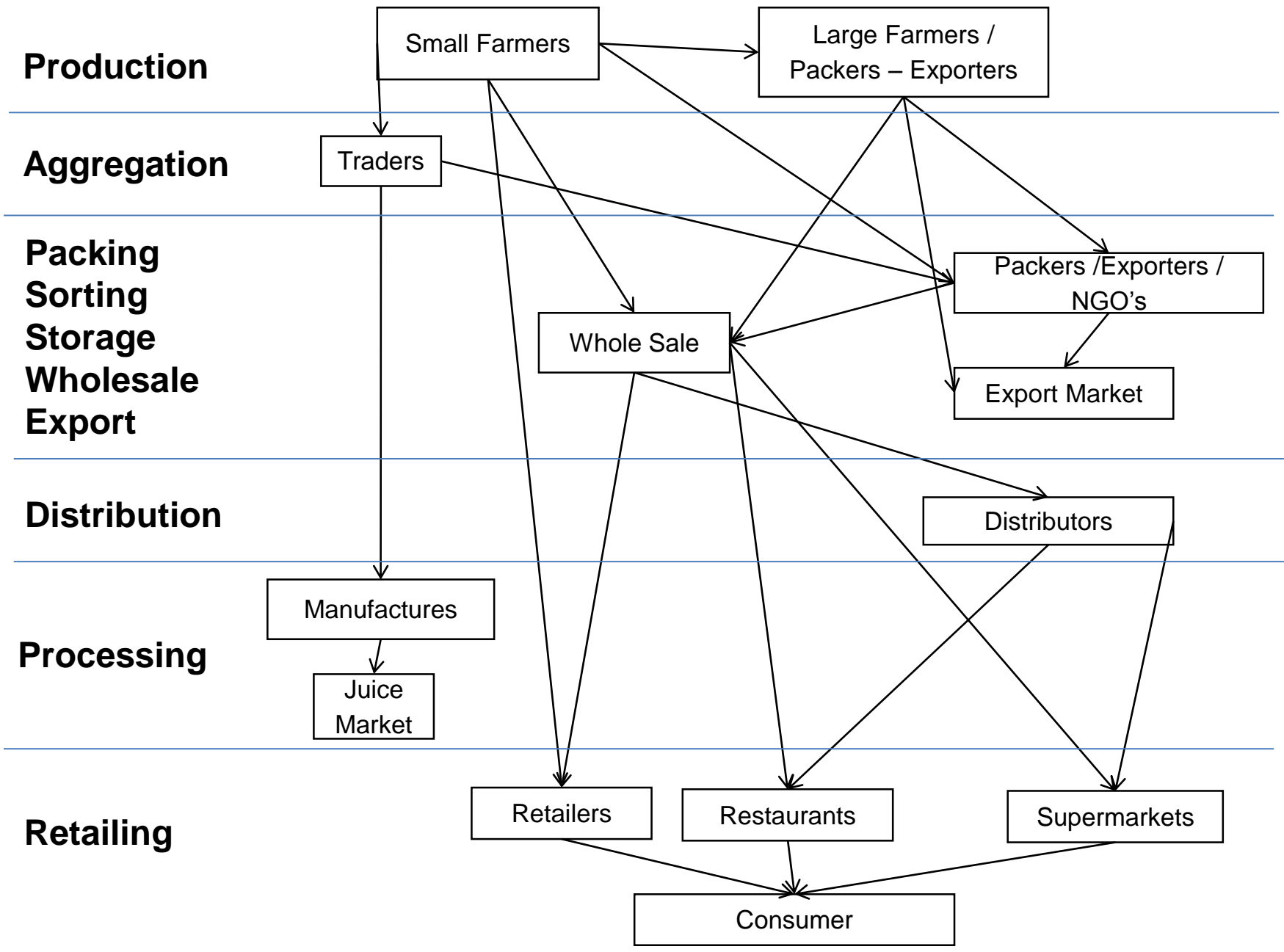
Estimated post-harvest losses of agricultural products in developing countries

Between 20 to 50 % And in some cases exceed these ratios.

In Lebanon, in one crate, more than 80% of apple fruits are mechanically damaged (Chahine and Tawk 2016 in progress).

Losses occur on several levels starting in the field due to poor farmers' practices, Poor practices are negatively affecting the reputation of the Lebanese apples both at local and export markets rendering the Lebanese apples unmarketable.

In the Screening Study the Apple Supply Chain Map was Identified



Postharvest Losses

1. Postharvest losses resulted from Preharvest Practices
2. Postharvest losses resulted from Harvesting Practices
3. Postharvest losses resulted from Postharvest Practices

Maturity Indices for Apples:

1. Starch Iodine (SI) Test for Maturity
2. Soluble Solids Content (SSC)
3. Fruit Firmness Test
4. Number of days from full bloom
5. Seed Color
6. Skin color

Cold Storage Operations:

1. Managing Temperature of Apples:
 1. Pre-Cooling:
 2. Cold Storage:
 3. Controlled Atmosphere

Transportation

Postharvest losses resulted from pre-harvest practices and solutions



Poor color for red varieties

Causes: improper pruning/high N fertigation

Solution :proper pruning & fertigation



Small sized fruits

Causes : improper thinning / low level K

Solution :proper thinning & fertigation



Brown secretions

Causes :*Cydia pomonella*(Apple codling moth)

Solution : pheromone traps / spraying insecticides (a.i Chlorantraniliprole)



Shallow cavities /Damaged fruits

Causes : *Archips argyrospila* (Apple Leafroller)

Solution: dormant oil spray to cover egg masses / spraying insecticides (a.i Chlorantraniliprole or flubendiamide or Bacillus thuringiensis or spinosad)

Postharvest losses resulted from pre-harvest practices and solutions



Bitter pit

Causes : high N & low Ca

Solution : proper fertilization + calcium sprays



Cork spot on apples.

Causes: Boron deficiency

Solution : spraying Boron before and after blooming .



Apple scab : *Venturia inaequalis*

Causes : high humidity & moderate temperature

Solution : proper pruning
preventive fungicides application
curative fungicides : fenarimol ,fluzilazole...



Pitting and deformity

Causes: Bugs

Solution: White sticky traps are used as monitoring /
Spray insecticides

Postharvest losses resulted from pre-harvest practices and solutions



Water Core

Causes : low Ca /low temperature in cold regions at high altitudes

Solution: Calcium sprays every 7 to 10 days till harvesting / avoid planting susceptible varieties.



Internal Browning or Brown Heart.

Causes : High nitrogen fertilization / Fruits subjected to low temperature in cold regions at high altitudes.

Solution : Reduce nitrogen fertilization / Use of calcium sprays every 7 to 10 days till harvesting.



Deformed shaped fruits or cracking

Causes : uneven irrigation / hail damage

Solution :irrigation program / using net houses (new orchards)

Postharvest losses resulted from pre-harvest practices and solutions



Russeting of apple fruit

Causes : apple rust mite

Solutions : winter oil / acaricides



Russeting

Causes : Some nutrient or pesticide sprays can puddle at the stem end

Solution : good spraying application



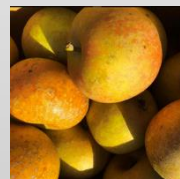
Netlike russeting on apple fruit surface

Causes : powdery mildew

Solution : sulfur sprays / fungicides



Frost ring



Naturally russeted apples

Common Preharvest Practices Affecting PH Losses

Pre-Harvest

- Inadequate planning regarding planting and harvesting dates, or growing cultivars that mature when market prices are lowest
- Production of cultivars with high yields but short PH life or susceptibility to PH pests and diseases
- Use of poor quality planting materials
- Over-fertilization with nitrogen
- Lack of use or inadequate use of calcium sprays for Apples
- Inappropriate irrigation practices (too close to harvest date)
- Poor orchard and field sanitation leading to latent infections and/or insects damage
- Lack of pruning and/or thinning fruits leading to small sized fruits with non-uniform maturation
- Lack of pest management

Common Preharvest Practices Affecting PH Losses

Harvest

- Harvesting at **improper maturity**
- Use of rough and/or unsanitary field containers
- Soil contamination of produce
- Harvesting during the **hot hours** of the day
- Rough handling**, dropping or throwing produce, fingernails punctures
- Leaving long or sharp stems on harvested produce
- Over packing** of field containers
- Exposure to **direct sunlight** after harvesting

Common Preharvest Practices Affecting PH Losses

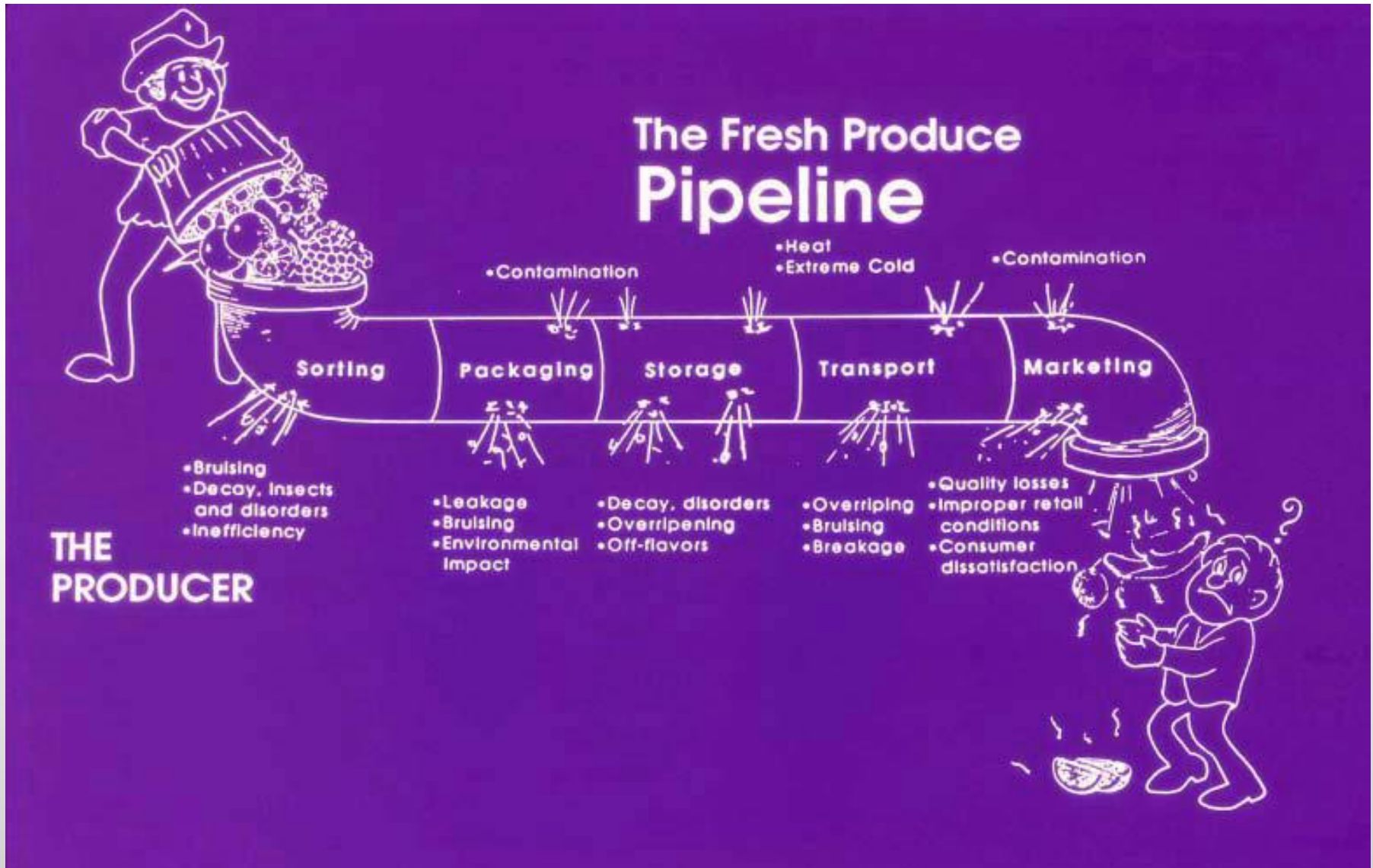
Post Harvest

- Lack of proper sorting
- Rough handling
- Misuse of postharvest treatments (**inadequate chlorine in wash water etc.**)
- Long delays without cooling
- Use of rough packing containers
- Lack of liners in rough baskets
- Over-loading containers
- No cooling during packing, transport, storage or marketing
- Lack of efforts to maintain high RH
- Poor sanitation
- Stacking produce too high
- Over-loading vehicles

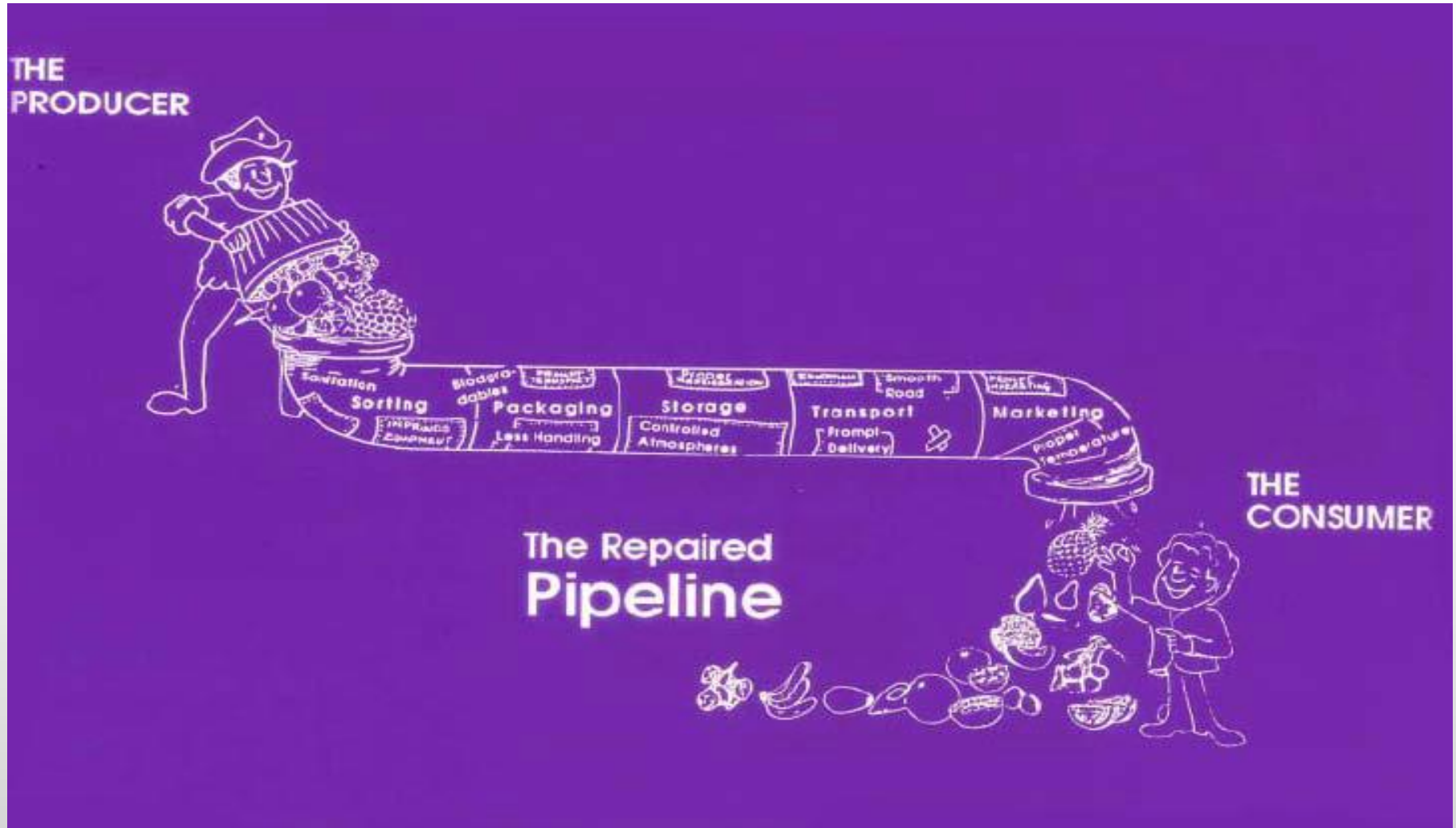
Important Types of PH Losses, Quality Deterioration & Food Safety Problems

Problems	Examples
Water loss (weight loss)	Shriveling, wilting of fruits and vegetables
Water loss (loss of texture)	Softening, limpness, loss of crispiness or juiciness
Mechanical damage	Bruises, cuts, surface abrasions
Physical losses due to pests	Fungal and bacterial diseases, insects attacks
Contamination	Soil, pathogenic bacteria (soil-borne diseases), pesticides and chemical residues
Losses from physiological disorders due to temperature	Chilling injury, freezing injury, heat injury, sunburn
Losses from physiological disorders due to nutrient imbalances	Calcium deficiency (bitter bit), boron toxicity
Losses from physiological disorders due to atmospheric gases	Damage from ethylene (induced browning), low oxygen, high CO ₂ ,
Nutritional losses	Loss of stored carbohydrates, loss of vitamin C

Cumulative problems and everyone involved to get to reduce the post-harvest losses



The objective of proper post-harvest practices is to reduce losses to gain access to:

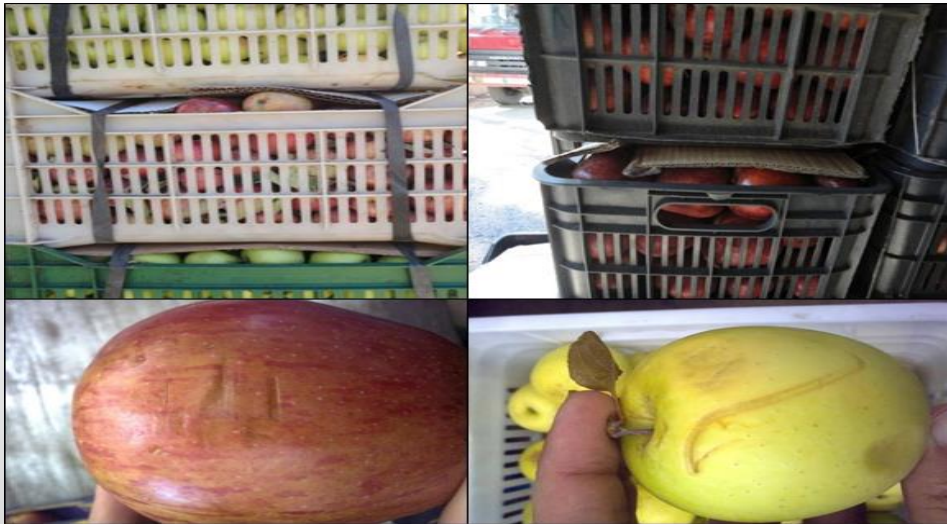




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Proper harvesting practices

Proper maturity stage can be identified by using Maturity Indices for apples :

1. Starch Iodine (SI) Test for Maturity.
2. Soluble Solids Content (SSC).
3. Fruit Firmness Test.
4. Skin color.
5. Number of days from full Bloom.
6. Seed Color.

Fruit Sampling:

1. Begin testing the fruit 4 weeks before the expected harvest, to obtain a baseline level for fruit maturity.
2. Repeat the test once a week.
3. Sampling frequency: 5 trees, 4 apples/tree (one from each side)

1. Maturity Indices / Starch Iodine (SI) Test for Maturity

Starch Iodine (SI) Test for Maturity:



1. This is a reliable method for determining maturity for most apple varieties
2. Is the easiest indicator of apple maturity.
3. As an apple ripens the starch in the fruit turns to sugar.
4. This test measures the level of conversion of starch to sugar.
5. An example of Starch Iodine Chart for Red Delicious

1. Maturity Indices / Starch Iodine (SI) Test for Maturity

**Immature
Lack of flavor**

**Over-mature
Short PH shelf-
life**



Compare SI readings with a SI chart

- Apples with an SI reading of 3-4 are suitable for long-term storage,
- Apples with a reading of 4-5 are best for short term storage,
- Apples with reading 6 or more should be placed in regular cold storage or marketed immediately.

2. Maturity Indices / Soluble Solids Content (SSC)

Sugars are the major soluble solids in fruit juices and therefore soluble solids can be used as an estimate of sweetness.

A hand-held **refractometer** can be used outdoors to measure % SSC (equivalent degrees Brix for sugar solutions) in a small sample of fruit juice.

- Mature fruits: 10 – 12%
- Immature fruits: 8 – 9%



Brix guide	Low	Fair	Good	Excellent
All Apple Varieties	<11%	11%	12%	13%



Fruit Firmness Test: The most common way to measure firmness is resistance to compression or pounds-force (lb-force).

Fruit penetrometer is a hand-held probe with a gauge for pounds-force.

Immediate shipment or use

14 – 18 lbs

Long storage

Variety	Firmness (pounds)*		
	Short term storage	Mid-term storage	Long term storage
Fuji	16	17	18
Gala	16	17	18
Golden Delicious	15	16	17
Red Delicious	16	17	18

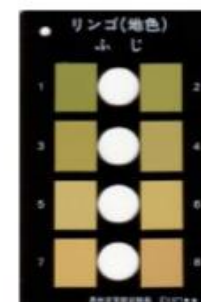
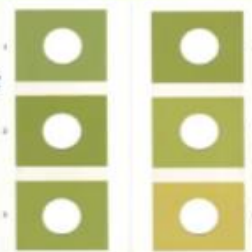
Skin color test

أجهزة قياس اللون



مخطط قياس اللون

Golden
Delicious



Fuji



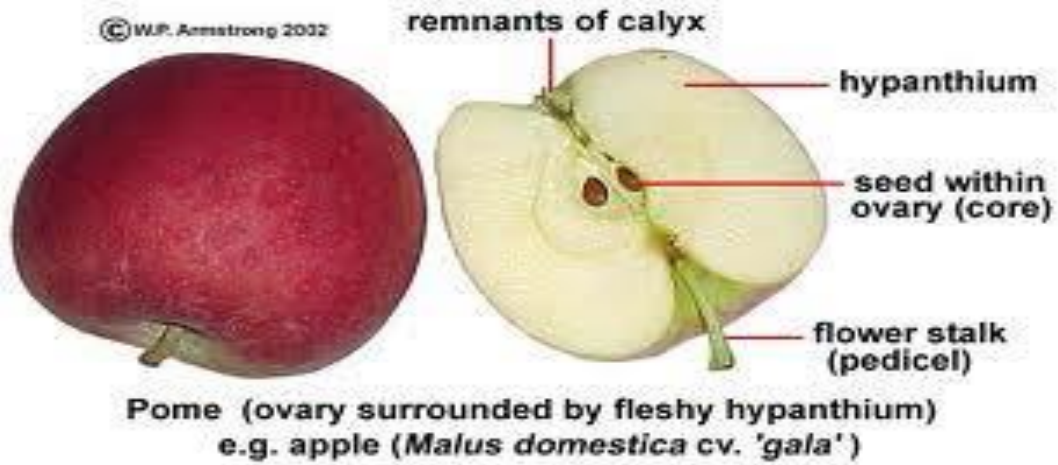
Granny Smith

Number of days from full Bloom.



1. Royal Gala: 125 to 135 days
2. Red Delicious: 145-155 days
3. Golden Delicious: 150-160 days
4. Fuji: 180-190 days

Seed color





Harvesting tools



- **Washing and disease control**
- Calcium chloride: 800 – 1000 ppm maintain fruit firmness
- Liquid chlorine: Reduce disease spread
- Diphenylamine (DPA): To Reduce Storage Scald and Internal Browning.



Optical grading



Precooling

- Pre-cooling is a separate operation done before storage and complementary to it.
- Precooling is the rapid reduction of apples' field temperature prior to storage and / or refrigerated transport.
- Pre-cooling is important to reduce respiration in apples.

Remember:

- Reducing fruit temperature leads to decrease in respiration and ethylene production.

Pre-cooling Methods Suitable for Lebanese Apples:

1. Room Cooling
2. Forced-Air Cooling



Cold Storage – *Lebanon*

Cold rooms

- Temperature: -0.5° – 0°C
- RH: 90 – 95% (not very common and via water sprays)

Old refrigeration techniques / no data loggers

Produce is stored mainly in individual PE crates stacked on top of each others, sometimes in pallets

Steel frame 3 or 6 crates in height

Wooden frames 15 to 18 crates in height



freezing injury



Scald



Bitter pit

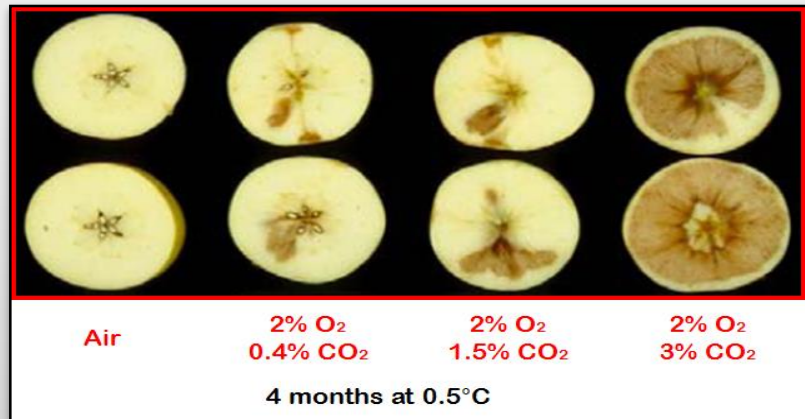


Symptoms of cork spot on
Melrose apple fruit.

Cork spot



Shriveling



Internal
browning

Air

2% O₂
0.4% CO₂

2% O₂
1.5% CO₂

2% O₂
3% CO₂

4 months at 0.5°C

Storage in Controlled Atmosphere

Conditions

- 1.5 to 12+ months
- Field bins, unsorted fruits
- Best fruits: early harvest
- General conditions
 - 0.7 to 3% O₂
 - 0.5 to 4% CO₂
- Vary by variety

Advantages

- Maintains firmness, ground color and acidity
- Reduces storage scald and bitter pit

Disadvantages

- May induce disorders such as internal browning

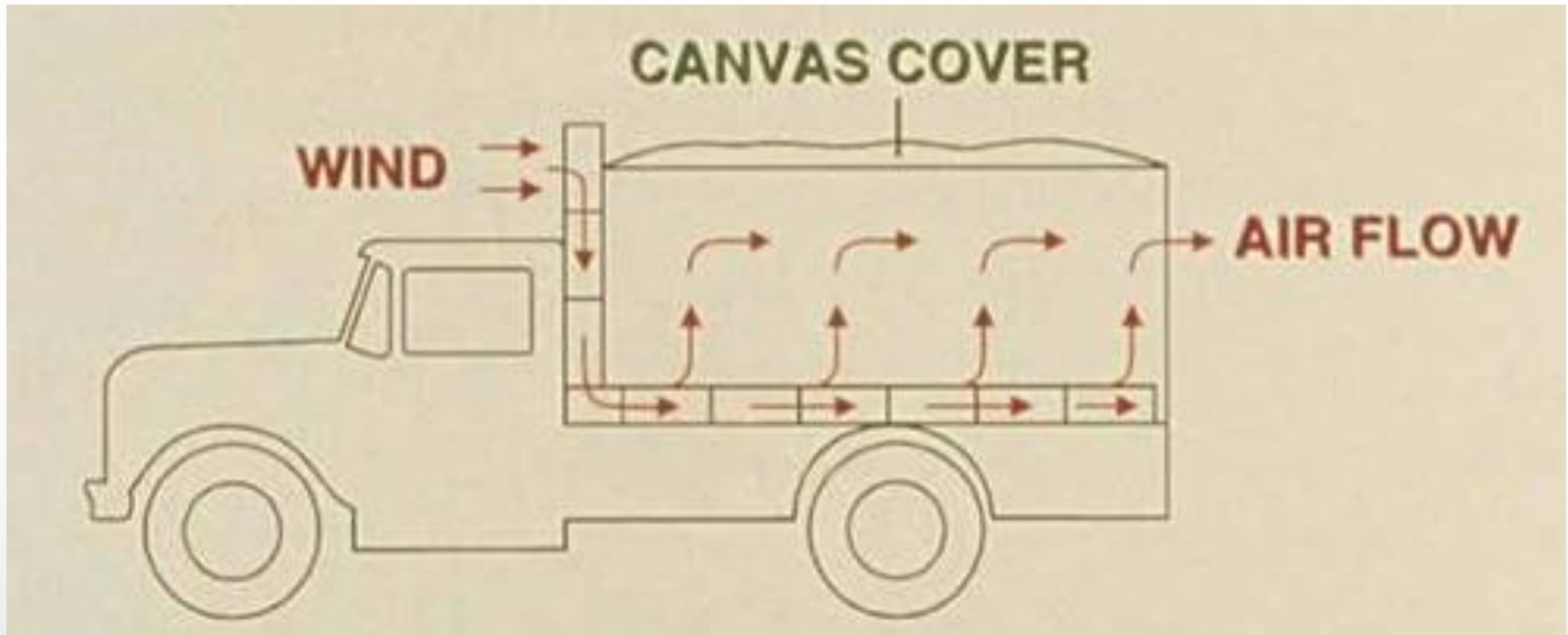
Internal browning

- CO₂ concentration
- Harvest day
- Temperature
- Orchard factors
- Seasonal factors

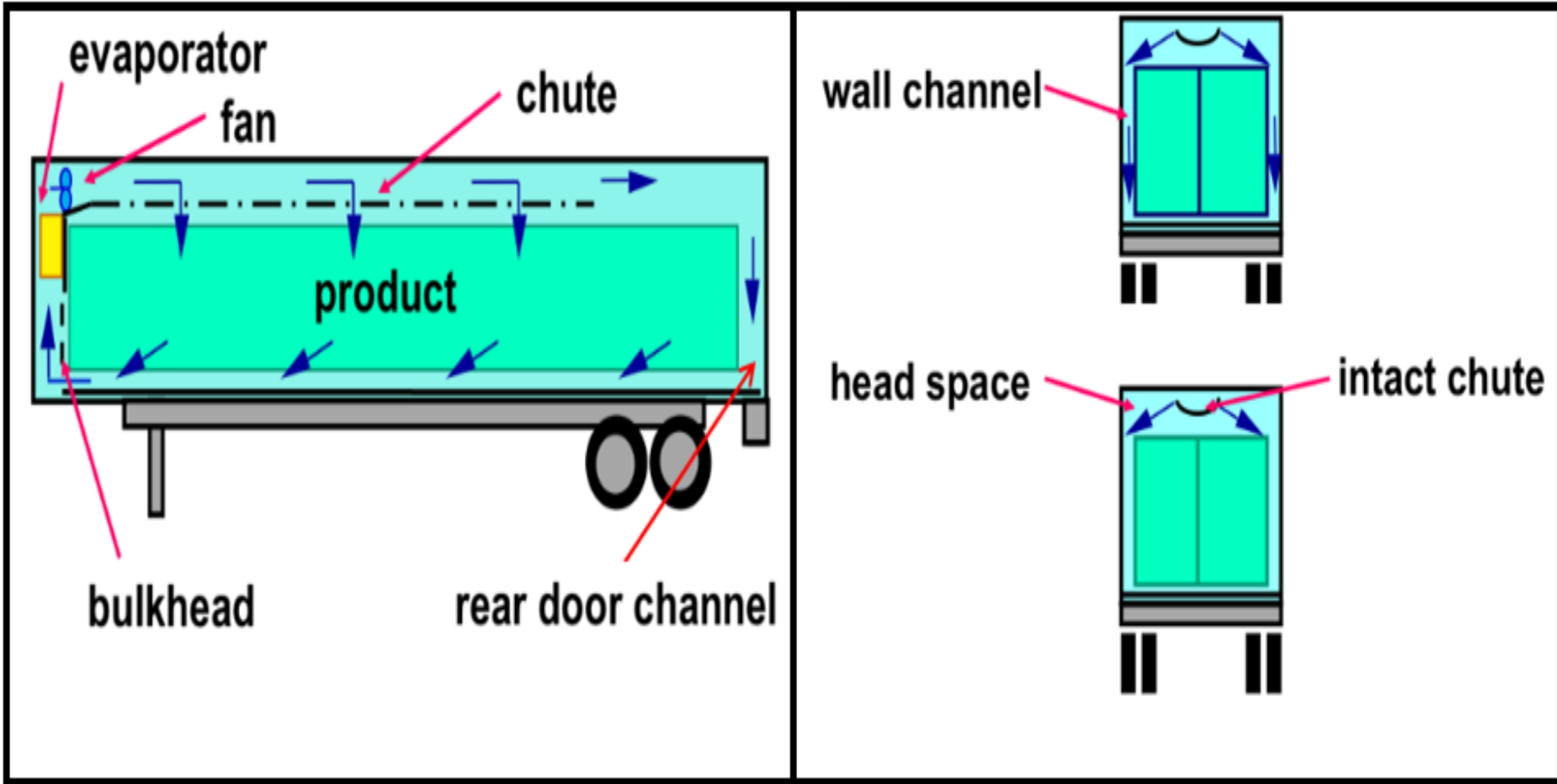
Controlled atmospheres are often used when apples are stored longer than 3 months, however, gala has shown benefits for as short as 1.5 months.

Maintains firmness, etc by reducing respiration and the effects of ethylene

Refrigerated transportation to local market



Transportation- Export



Recommendations

كيف ما كنت بحبك

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THANK YOU