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Mini MBA Humanitarian Logistics and Supply Chain: supplying fast, well and fairly

Course handout · Week 2 : Forecasting demand and planning supply

A programme of exactly 3 months (12 weeks, 144 hours) to lead a humanitarian supply chain: mapping and landed cost, demand forecasting and safety stocks, procurement and competitive bidding, Incoterms and contracts, transport, warehouses and inventories, fleet and fuel, customs and exemptions, prepositioning and distributions, health products and the cold chain, performance, costs and the environment, constrained contexts and data protection. Corrected numerical exercises, three monthly exams with case studies, and a verifiable diploma from the Humanitarian Academy.

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Week 2 : Forecasting demand and planning supply

Objectives

- Turn a programme plan into quantified needs (quantities, schedule) and a procurement plan.
- Calculate a safety stock, a reorder point and an order quantity, and monitor a pipeline.
- Organise joint planning between programmes, logistics and finance to avoid stock-outs and overstocks.

From programme to quantified need

Planning starts with a simple question: **what, how much, where, when**. It requires close dialogue with programmes, who know the beneficiaries, and with finance, who know the budget.

Methods for estimating needs:

- **By population**: number of people × standard. Example: 12,000 people, 15 litres of water per person per day (Sphere minimum standard), i.e. 180 m³ per day.
- **By past consumption**: average stock issues over recent months, corrected for stock-outs (a stock-out lowers apparent consumption).
- **By service**: number of consultations × prescription rate. Example: 3,000 consultations per month, 30% receive an antimalarial: 900 treatments per month.

The **procurement plan** lists, for each item: specifications, quantity, date required, procurement method, estimated lead time, launch date, budget and budget line. The launch date is calculated backwards: date required − total lead time.

Average consumption and forecasting

For an item with regular consumption, the **average monthly consumption** (AMC) over 3 to 6 months is used, corrected for:

- **stock-out days**: corrected AMC = observed consumption × days in the month / days with stock available;
- **planned changes**: new area, influx of displaced people, campaign, season.

Example. A health centre consumed 600, 640 and 450 sachets of ORS over three 30-day months; the third month had 10 stock-out days. Corrected consumption for the third month: 450 × 30 / 20 = 675. Corrected AMC = (600 + 640 + 675) / 3 ≈ 638. If a diarrhoea outbreak is expected with a 50% increase, the forecast for the season is 957 per month.

For seasonal items or items linked to a sudden-onset crisis, the forecast relies on **scenarios** (most likely, reasonable worst case) rather than on history.

Safety stock and reorder point

Safety stock protects against two uncertainties: demand higher than expected and a delivery lead time longer than expected. A simple method, widely used in the sector:

Safety stock = AMC × safety margin (in months). The margin depends on variability: often 1 to 3 months in difficult contexts.

Reorder point = AMC × replenishment lead time (in months) + safety stock. When available stock reaches this level, the order is placed.

Maximum stock = reorder point + AMC × interval between orders.

Example. AMC 1,000 units, replenishment lead time 3 months, safety stock 2 months, review every 2 months. Safety stock = 2,000. Reorder point = 3,000 + 2,000 = 5,000. Maximum stock = 5,000 + 2,000 = 7,000. If available stock is 4,600 and 1,500 units are already on order, the quantity to order to return to the maximum is: 7,000 − 4,600 − 1,500 = 900 units.

> Always count stock on order (the pipeline): forgetting it means ordering twice.

The pipeline and pipeline breaks

A programme's **pipeline** (especially for food assistance or nutrition) tracks, month by month, needs, stocks, expected arrivals and funding. It makes it possible to anticipate a **pipeline break** several months in advance.

Month	Opening stock	Arrivals	Needs	Closing stock
January	900 t	500 t	700 t	700 t
February	700 t	0	700 t	0
March	0	400 t	700 t	−300 t
April	0	0	700 t	−700 t

The break appears in March (300 t missing), then becomes total in April. With a procurement lead time of 4 months, the decision had to be taken in November. Options in January: borrow from another programme or from a national stock (with documented repayment), faster local or regional purchases, temporary reduction of the ration (a programme decision, communicated to beneficiaries), or prioritisation of the most vulnerable groups.

Integrated planning

Stock-outs and overstocks rarely come from a calculation error. They come from a **lack of coordination**: the programme changes area without informing logistics, finance has not released the budget, the tender is waiting for a signature.

Good practices:

- **Monthly planning meeting** of programmes, logistics and finance: needs for the next three months, status of procurement, budget committed.
- **Procurement plan validated at the start** of each grant, aligned with the budget and the workplan.
- **Shared indicators**: procurement lead times, stock-out rate, months of stock available per item.
- **Specification freeze**: a change of specification after the tender is launched often costs weeks.

Months of stock available = available stock / AMC. A 9-month stock for an item with a 2-month lead time is an overstock: tied-up capital, risk of expiry and storage cost.

Joint procurement, framework agreements and prepositioning

Three levers reduce lead times and costs when demand is recurrent:

- **Framework agreement** (long-term agreement): a supplier selected through competitive bidding commits to prices and lead times for 1 to 3 years; orders are placed as needs arise without re-tendering. Procurement lead time reduced by several weeks.
- **Joint procurement** between projects or between organisations: higher volumes, better prices, but heavier coordination.
- **Prepositioning**: contingency stocks close to at-risk areas before the cyclone or rainy season.

Calculating the benefit of a framework agreement. Without an agreement, 6 purchases per year, each with a 5-week tender and 2,000 USD in administrative cost. With an agreement, one 8-week tender every 2 years (5,000 USD) and an order lead time of one week. Annual administrative cost: 12,000 USD versus 2,500 USD; lead time per order: 5 weeks shorter. The safety stock required also falls, since the replenishment lead time is shorter.

Exercise: avoiding a stock-out of therapeutic food

Situation. Nutrition programme: 1,200 children admitted per month, each consumes on average 1.5 cartons of ready-to-use therapeutic food over their treatment. Available stock: 2,400 cartons; on order: 1,800 cartons expected in 2 months. Replenishment lead time: 3 months. Policy: 2-month safety stock, monthly review.

Tasks. 1) AMC. 2) Safety stock, reorder point and maximum stock. 3) Should you order, and how much? 4) When will stock run out without a new order?

Answer. 1) AMC = 1,200 × 1.5 = 1,800 cartons. 2) Safety stock = 3,600; reorder point = 1,800 × 3 + 3,600 = 9,000; maximum stock = 9,000 + 1,800 × 1 = 10,800. 3) Available stock + on order = 4,200, well below the reorder point: order 10,800 − 4,200 = 6,600 cartons immediately. 4) The stock of 2,400 covers 1.33 months; the 1,800 cartons arrive in month 2: at the end of month 1, 600 remain; during month 2, 1,200 cartons are missing before the arrival if it takes place at the end of the month. The stock-out is imminent: in parallel, request a loan from a partner or from the nutrition cluster's stock, and expedited delivery of the order in progress.

Key takeaways

- Plan: what, how much, where, when; launch date = date required − total lead time.
- Correct consumption for stock-out days before calculating the AMC.
- Reorder point = AMC × lead time + safety stock; always deduct stock on order.
- The monthly pipeline reveals a break in time to act; the decision is taken one procurement lead time in advance.
- Framework agreements and prepositioning reduce lead times, costs and safety stocks.

Quiz

1. Observed consumption 400 over a 30-day month with 6 stock-out days. Corrected consumption:
   A. 400
   B. 480
   C. 500
   D. 320

2. AMC 500, lead time 2 months, safety stock 1 month. The reorder point is:
   A. 1,500
   B. 1,000
   C. 500
   D. 2,000

3. Maximum stock 3,000, available stock 1,200, on order 800. Quantity to order:
   A. 1,800
   B. 1,000
   C. 2,200
   D. 3,000

4. Available stock 4,500, AMC 500. The number of months of stock is:
   A. 4.5
   B. 5
   C. 0.11
   D. 9

5. 12,000 people at 15 litres per person per day represent:
   A. 18 m^3 per day
   B. 1,800 m^3 per day
   C. 180 m^3 per day
   D. 12 m^3 per day

Quiz answers : 1. C · 2. A · 3. B · 4. D · 5. C