



Food and Agriculture Organization  
of the United Nations

# Allocating pre-production costs in multi-year enterprises

Short Training Course on  
Agricultural Cost of Production  
Statistics

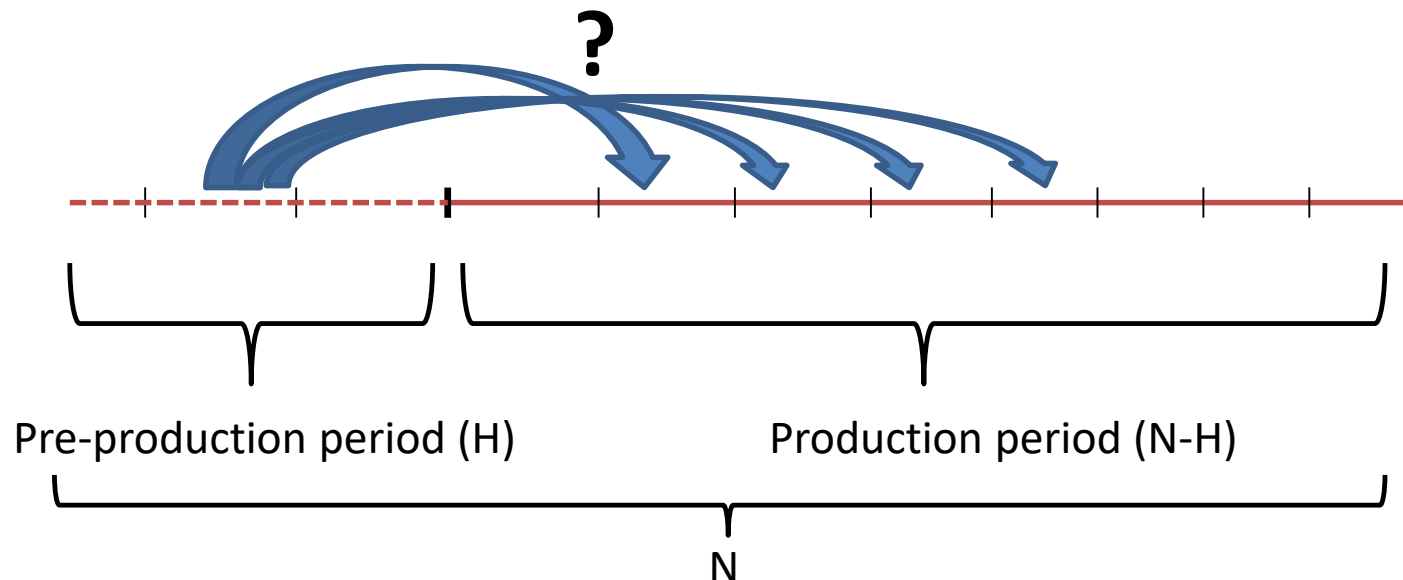
# 1 – What are pre-production costs ?

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- **Pre-production costs are incurred at least one year in advance of the time period when the commodity is actually produced** and can be sold on the market
- They are also called **establishment or installation costs**
- **AEAA Handbook definition:** “The pre-productive period begins with the first expense associated with establishing the crop enterprise and ends in the crop year just before the crop yields a substantial percent of its expected mature yield (usually 70-80%)”
- Examples:
  - Establishment of a new coffee plantation: preparation of the soil, buying and planting the coffee trees, expenses related to tree nursery, etc.
  - Establishment of a new orchard for the production of flowers, etc.

## 2 - Why pre-production costs should be allocated?

- **To obtain relevant and comparable cost and revenue estimates**, pre-production expenses need to be allocated to the year or years in which production takes place
- **For production which are entirely harvested in a single-year** (ex: annual crops), all the pre-production costs are allocated to this production year
- **When production is distributed over several years** (ex: plantations, orchards, perennial crops), the question becomes more complex



## 3 - Concepts and definitions (1/2)

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- **What costs should be allocated ?**
  - **All cost items** (direct, indirect, labour, land, capital)
  - They should be estimated using the same methodologies as those described in this training (and in the Manual)
- **Secondary products:** the revenues and costs associated with the selling of secondary products during the pre-productive years (ex: banana production on cacao plantations) should be added/deducted to/from preproduction costs
- **The production of the commodity before it reaches its mature yield** should also be accounted for and valued

## 3 – Concepts and definitions (2/2)

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- When there is a substantial lag between the moment costs are incurred and production effectively takes place:

=> it is important **adjust nominal costs for inflation**

- **Pre-production costs = the net returns during the pre-productive years** adjusted to the end of the pre-productive period:

$$PPC = \sum_{t=1}^H (1+i)^{H-t} R_t$$

- $R_t$  is the difference between revenues and costs in year  $t$  (= net returns, usually negative during the preproduction period)
- $H$  is the length in years of the pre-productive period
- $i$  is the annual inflation rate

## 4 – The traditional budgeting method (1/2)

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- Accumulated costs (capital and non-capital) are allocated to the productive years using a **linear depreciation schedule**:

$$D = \frac{PPC - SV}{N - H}$$

- D is the portion of the establishment costs that will be charged against each productive year
- N-H is the length in years of the productive period (N is the total life span of the enterprise)
- SV is the value of the enterprise, excluding land, at the end of its productive cycle (salvage value)

## 4 – The traditional budgeting method (2/2)

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- **Time adjustments:**

- PPC and SV should be expressed in the prices referring to the last pre-productive year
- The amounts charged to each production year should be expressed in current prices:

$$D_t = D(1 + i)^t$$

- **Advantages:**

- Easy to implement and understandable
- Similar to what is usually done to estimate capital depreciation

- **Drawbacks:**

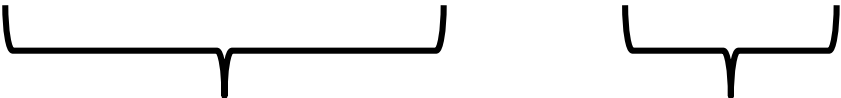
- Is the linear depreciation schedule a realistic/appropriate one ?
- The determination of SV is not easy

## 5 – The cost recovery (or annuity) approach (1/3)

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- The accumulated total is amortized over the production period using an annuity formula
- The annual amount to be charged against each production year ( $A$ ) is such that:

$$PPC - \frac{SV}{(1+r)^{N-H}} = \sum_{t=H+1}^N \frac{A}{(1+r)^t}$$



Net PPC at end of the pre-production period prices  
("present")

Present value of the amount to be charged

- It follows that: 
$$A = \frac{r}{1 - (1+r)^{H-N}} NetPPC$$



## 5 – The cost recovery (or annuity) approach (2/3)

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- **Time adjustments:** the amounts  $A$  charged to each production year need to be adjusted for inflation only if  $r$  is a real interest rate (i.e. excluding inflation)
- **Advantages:**
  - It is consistent with business accounting practices
  - It is economically founded
- **Limitations:**
  - Determining  $SV$  (an option could be 0)
  - Sensitivity to the choice of the interest rate  $r$

## 5 – The cost recovery (or annuity) approach (3/3)

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### Example: installation costs of a new coffee plantation in Colombia

- **Assumptions**

- $H = 3$  (marginal production starts at year 2, neglected here)
- $N-H = 7$  (variable depending on production type)
- $r$  (nominal interest rate) = 15%
- $SV = 0$  (excluding the value of land, the remaining is biomass)
- $PPC = 9.000.000$  COL per hectare

- **Results:**

- **Net PPC** = 9.000.000 per hectare (SV is 0)
- **A** = 2.163.243 per hectare (~ 720 USD)  
-> This amount is charged against the revenues of each production year

## 6 – The current cost approach (1/2)

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- **Adapted to situations where the farm is at the production equilibrium or steady-state, i.e. having reached the maximum of its potential yield**
- **Allocated PPCs are determined as a share of current costs (CC)**
- **This share is closely related to the steady-state replacement rate of the assets, for examples:**
  - 5% of a herd may need to be replaced annually to maintain stable the number of heads
  - 10% of a plantation may have to be renewed each year to maintain a stable average plantation age (and therefore yield)

## 6 – The current cost approach (2/2)

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The calculation are done in 4 steps:

- Step 1: **determine the ratio  $r = \text{PPC}/\text{CC}$**  (assumed to be fixed for a given time period under the assumption of fixed technology)
  - $\text{CC} = \text{change in asset value} + \text{operating costs associated with these assets}$
  - **This operation has to be done with data spanning a sufficiently large time period** (e.g. average of 3 years) to reduce the risk that outlier observations might distort the ratio
- Step 2: **apply  $r$  to the estimated annual current costs  $\text{CC}(t)$**
- Step 3:  **$r \cdot \text{CC}(t)$  is charged against production for the year  $t$**

# 7 – Market value approach

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- Similar to the CC method, with the **PPC estimated using opportunity costs (market values)** instead of actual costs:
  - PPC are estimated as the foregone revenues from the selling of the assets (livestock, trees, etc.) instead of holding them
  - For example, market prices for replacement animals are used to estimate PPC for a livestock farm, as opposed to building up the actual costs associated with livestock breeding herd
- **Advantage:** ease of implementation; particularly adapted for livestock pre-production expenses
- **Drawbacks:**
  - Markets might not exist or may be too thin, in which case the current cost method may be used
  - Market valuations might be biased towards future earnings and not historical costs

## 8 – Yield or production-based allocation (1/3)

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- It is an allocation rule based on a **non-linear depreciation schedule**
- PPC calculation:
  - Establishment expenses comprise capital as well as variable costs
  - Production occurring during the pre-production period for the main commodity are not deducted from PPC
- The amount to charge against each production year is proportional to the share of current production in the total expected production for the productive years:

$$D(t) = PPC \cdot \left[ \frac{Q(t)}{\sum_{t=H+1}^N Q(t)} \right]$$

## 8 – Yield or production-based allocation (2/3)

- **Example:** N=10, H=3, PPC=500

	Years	Production shares (%)	Allocated PPC (D)
Pre-production years	1	0	0
	2	0	0
	3	0	0
Production years	4	10	50
	5	10	50
	6	20	100
	7	30	150
	8	20	100
	9	5	25
	10	5	25

## 8 – Yield or production-based allocation (3/3)

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- **Advantages:**

- Easy to implement and intuitive
- Assumes a non-linear depreciation schedule, reflective of the farm's production cycle

- **Drawbacks:**

- It is dependent on the schedule assumed for yields, which varies necessarily across varieties, regions, etc.
- It has to be refined to include revenues and costs associated with secondary commodities



## 9 – References

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- **AAEA Task Force on Commodity Costs and Returns (2000).** *Commodity Costs and Returns Estimation Handbook*. United States Department of Agriculture: Ames, Iowa, USA.
- **Global Strategy to Improve Agricultural and Rural Statistics (2016),** Handbook on Agricultural Cost of Production Statistics, Handbook and Guidelines, pp. 80-84. FAO: Rome.