Allocating pre-production costs in multi-year enterprises

1 – What are pre-production costs ?

- **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:

    o Establishment of a new coffee plantation: preparation of the soil, buying and planting the coffee trees, expenses related to tree nursery, etc.

    o 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

Pre-production period (H)   Production period (N-H)

N
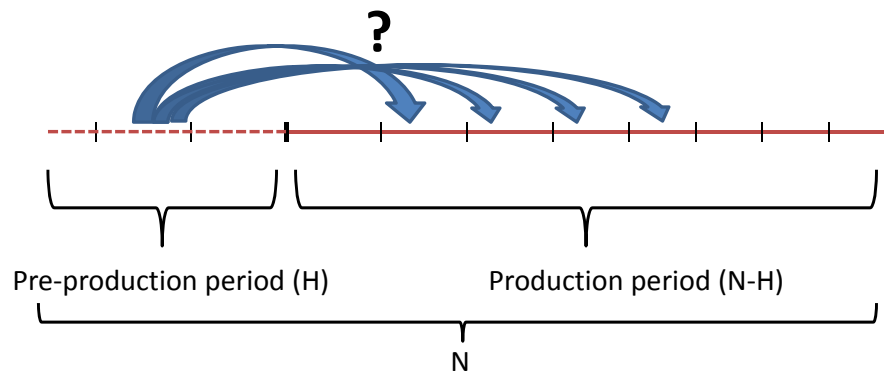
3 - Concepts and definitions (1/2)

- **What costs should be allocated ?**

  o **All cost items** (direct, indirect, labour, land, capital)

  o 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)

• 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:

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

o R_t is the difference between revenues and costs in year t (= net returns, usually negative during the preproduction period)

o H is the length in years of the pre-productive period

o i is the annual inflation rate

4 – The traditional budgeting method (1/2)

• 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)

- **Time adjustments**:

  o PPC and SV should be expressed in the prices referring to the last pre-productive year

  o The amounts charged to each production year should be expressed in current prices:

$$D_t = D\left(1 + i\right)^t$$

- **Advantages**:

  o Easy to implement and understandable

  o Similar to what is usually done to estimate capital depreciation

- **Drawbacks**:

  o Is the linear depreciation schedule a realistic/appropriate one ?

  o The determination of SV is not easy

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

- **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:

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

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

Present value of the amount to be charged

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

- **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

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

- It is an allocation rule based on a **non-linear depreciation schedule**

- PPC calculation:

    o Establishment expenses comprise capital as well as variable costs

    o 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:

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

6 – 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**

6 – Yield or production-based allocation (3/3)

- **Advantages**:

  o Easy to implement and intuitive

  o Assumes a non-linear depreciation schedule, reflective of the farm's production cycle

- **Drawbacks**:

  o It is dependent on the schedule assumed for yields, which varies necessarily across varieties, regions, etc.

  o It has to be refined to include revenues and costs associated with secondary commodities

8 – References

- **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.