

# 9

## Categorising farm costs and farm revenue

This chapter categorises dairy enterprise costs and returns (or revenue) for ease of monitoring.

### The main points in this chapter

- Farm costs can be split into two main types: overhead (or fixed) and variable (or direct) costs.
- Overhead costs are not directly related to the level of production and must be paid regardless of whether anything is produced or not. For the purposes of this book, all labour costs (whether paid or imputed) will be considered as overhead costs.
- Variable costs are directly related to the level of milk produced in the dairy enterprise and include such items as feed (fodder and concentrate), fertiliser, herd and shed costs.
- Farm labour can be supplied either by employed staff or the farm family, who receive no cash payments. Family labour must be costed and it is usually based on the opportunity cost or the cost of employing someone else to undertake the farm tasks.
- Capital investments are not normally included as farm costs, just their depreciation, usually based on the replacement value at the end of their effective working life.
- Personal costs, or household expenses, are either categorised separately from farm costs or included within part of the farm operator's allowance (or imputed salary).
- Dairy enterprise costs on Asian smallholder farms can conveniently be broken down into four categories, two variable (herd and shed and feed) and two overhead (cash and imputed) costs.
- Farm revenues are derived from farm income, sales of capital items and other farm related cash sources.
- Inventories of farm assets record imputed income such as changes in value of live stock.



**Figure 9.1** A dairy adviser calculating farm input costs following the interview with the smallholder farmer (North Vietnam)

It is not easy to say precisely how much it costs to own and operate, or even to operate a rented dairy farm. To some extent, dairy enterprise costs and revenue are what the farmer considers they are. Some are obvious and easy to measure, such as cash costs and income, while others are ‘hidden’ and depend on opinions and assumptions.

Hidden costs include non-cash ones, such as depreciation and opportunity costs. The amount of these hidden costs depends on value judgements made by the farmer. For example, how long is the working life of a piece of machinery and how much would the farmer receive for it if he worked off-farm?

## 9.1 The costs of farm production

Actual costs of production are the sum of two components:

- Overhead (or fixed) costs which are not directly related to the amount of milk sold by the farmer, as they must be paid whether or not anything is produced. These include land rent, government land taxes, loan repayments and other finance costs, and living expenses
- Variable (or direct) costs which are directly related to the farm’s milk output and so to the amount of variable inputs, such as fertilisers, purchased concentrate and forages, and herd costs. Labour costs can be categorised either as overhead or variable, but in this book they will all be considered as overhead costs.

### 9.1.1 Overhead costs

As overhead costs are there no matter how much milk is produced, they are major components of farm costs for low production farms. However, the more milk the farm produces, the lower the overhead costs per kg of milk produced. Overhead costs can then be diluted by increasing farm output.

The average cost of production highlights the gains that can be made from having a farm large enough to spread the overhead costs and produce each unit more cheaply than is possible with a smaller sized operation. This is called achieving economies of scale. In addition to the inefficiencies arising from being too small, there can also be inefficiencies from being too large. For example, poor farm management can reduce farm output and have a dramatic effect on farm costs.

With higher total overhead costs per hectare of land, the smallholder farmer (with say eight milking cows and one hectare of forage crop) has to spend more before his costs start to cover the variable inputs such as fertiliser and weed control, which are the important inputs to increase forage yields. Therefore, for the same amount of money spent per ha, the larger farmer (with say 24 milking cows and three hectares of forage crop) is at an advantage with a greater proportion of his investment covering the variable production costs.

Makeham and Malcolm (1986) break overhead costs down to two categories, total and operating:

- Total overheads are those unavoidable costs that have to be met each year. These include essential living costs of the farm family, workers wages, finance costs, rent, replacement of capital items, government taxes, administration costs (e.g. insurance, telephone), running costs of farm vehicles, repairs and maintenance to farm infrastructure.
- Operating overheads are those associated with the annual business operation of the farm. This takes into account the operator allowance (or imputed labour), depreciation, registration of farm vehicles, other business expenses.

Whether there is much to be gained in managing the farm business by this breakdown of overhead costs is debatable.

With mixed farming, the relevant overhead costs should be shared between the different farm enterprises, using some criteria to determine the proportion allocated to the dairy enterprise, for example, the gross cash output generated by each one.

### 9.1.2 Variable costs

Overhead costs have to be met regardless of whether the farm is producing or not. Farmers have more decision-making choices over variable costs. For example, if things are going badly and the farm is losing money, the farmer might think about whether to continue operating. If he is more than covering variable costs, and therefore is able to meet some of the overhead costs, which reduce the overall loss, he would be better off continuing to operate, at least for a short term. However, if he is not even covering variable costs, he would be better off closing down.

Variable costs are proportional to the level of intensity of each farm activity, whereas within limits, overhead costs hardly change. For example, a well-managed forage crop, producing say 20 t DM/ha/yr, would require higher variable costs (but not necessarily twice as much) as a poorly managed crop only yielding 10 t DM/ha/yr. Identifying the variable costs for a particular farm activity provides the farmer with some indication of how they can change if he expands or contracts this activity.

As a contribution to production costs, variable costs vary a lot less than do overhead ones, but they are not constant because of reduced efficiencies of production. As more and more variable inputs are used, there comes a point when each extra input adds less to output. In other words, it then takes more and more input to produce an extra unit of output, because of the principles of diminishing returns. This is best understood by considering the changing level of farm production and the concept of average and marginal levels and efficiencies of production, as discussed in Chapter 5.

For the smallholder farmer, who is generally operating at the low level of farm performance, the principles of diminishing returns are a lot less relevant than the ability to dilute overhead costs by increasing farm output.

### **9.1.3 Opportunity and labour costs**

The opportunity cost is that incurred when using money to operate the farm. There are other opportunities for using these funds rather than dairy farming. This is particularly important when considering the operating farmer's labour. If there is a real chance for him to do something else with his own labour, rather than manage his dairy farm, or it is likely he would consider doing something else, then he should consider the opportunity cost of using his labour to run his farm. The opportunity cost of his labour would then be the income forgone by not working off the farm or by not using farm labour in some alternative enterprise on the farm. It could also be defined as the cost of employing someone else to do his work on the dairy enterprise.

As many smallholder dairy farmers are also mixed farmers who grow cash crops as well as milk cows, the opportunity cost of labour and variable costs of milk production are very relevant to his decision making. He should cost out each enterprise on his farm, firstly to help decide how big each one should be at this particular time, but of equal importance, to analyse the effect of changing farm returns for his cash crops or his raw milk, on the optimum size of each enterprise. Sensitivity analyses will assist in this decision, and these are discussed in Chapter 15.

As real incomes increase across economies, wage demands by labourers also rise and the dairy sector is forced to assess its opportunity costs and hence its scale of production. Increased labour costs bring about substitution of capital and/or land for labour input on the farm, which typically requires shifts in technology, including higher productivity of stock and feed. Larger herds per labour unit need to produce higher returns and production systems based on family labour are replaced by those employing hired labour. Increases in land values also influence production systems in that extensive grazing systems are replaced by labour intensive systems based on planted fodder, stall feeding and more purchased feed. Low labour costs and high land values are a most

common feature of traditional smallholder dairying and are key reasons for its predominance in developing countries. In fact, with low labour costs, there are few economies of scale in production due to limited incentive or means to invest in scale-dependent technology.

### 9.1.4 Capital investments

Capital assets are defined as assets that contribute to farm production over at least a medium-term period, of 12 months, for example, such as land, buildings, farm machinery and equipment. Investing in capital assets can be funded through farm profits or loans from credit organisations. These investments occur at irregular intervals and usually add to the productive resources and hence long-term profitability of the farm. They differ from overhead costs which are annual and largely unavoidable farm costs that are a prerequisite to generating farm income. Accordingly, capital costs are not normally included in an annual financial analysis, just the depreciation of those purchased items that are usually replaced at the end of their useful life. As expressed succinctly by Malcolm (pers. comm.), capital is not a cost; depreciation of capital is the cost. Depreciation is generally calculated using the ‘straight line’ approach by assuming that items lose value by the same amount each year. Some capital items such as land can appreciate over time, but unless the land is actually sold, it is only an imputed source of farm revenue.

Livestock would be included within the definition of capital assets, however, they are treated differently in annual farm business analyses. They are considered separately within an annual livestock inventory and stock trading account. The stock inventory takes into account their births and deaths, change from one class of stock to another, such as heifer calves growing into yearlings or from yearlings to milking cows, and of most importance any changes in their value. The stock trading account quantifies the actual sales and purchases of the stock. For most farms, the value of the stock inventory increases each year so it is a source of imputed revenue rather than a cost.

### 9.1.5 Finance costs

Loans generally require an agreement for them to be repaid over a predetermined period, with additional costs incurred as interest. Repayments of the principal of such loans, being considered as capital costs, are not normally included in annual financial analyses. However, the interest on the borrowed capital investments is part of the overheads as a finance cost, as are other charges from banks or lending agencies. Finance costs also include rent or lease costs on land and other farm capital assets.

### 9.1.6 Personal expenses

Personal or household expenses include purchased food, clothing, medical, education (school fees, excursions), family travelling/holidays and any other non-farm personal drawings. These can either be categorised separately or included within the farm operator’s allowance. In farm business analyses it is normal practice to include them within the farmer’s imputed labour costs.

## 9.2 Breaking down costs on smallholder dairy farms

For the purpose of calculating the cost of production (COP) of milk production on smallholder dairy farms in later chapters, farm costs have been broken down in Table 9.1 and Figure 9.3 on pages 110 and 111 into four categories, two variable and two overhead as follows:

1. **Variable costs.** These are broken down into:
  - Herd and shed costs: to maintain the entire dairy herd and to harvest the milk
  - Feed costs: to feed the milking herd.

The more milk produced and the bigger the dairy herd, the greater these variable costs.

2. **Overhead costs.** These are broken down into:
  - Cash overhead costs which involve actual payments, such as for employed labour and interest on borrowed money, rates and other farm administration costs.
  - Imputed overhead costs, or hidden costs because no cash changes hands. Family labour is the classic example where the farmer and his family work the farm but all too frequently don't pay themselves for their labour. Depreciation of farm equipment is another imputed cost which becomes obvious when the equipment must be replaced.

The question often arises, what is the farm manager worth to the business? The answer is either what he could earn if he spent that time being paid to do other work (that is the opportunity cost of his farm labour), or what it would cost to employ someone else to do his job. With regard to the latter, as it requires more skills to manage a large dairy herd (say 100 cows) than a small one (say 10 cows), the bigger the herd and the more complex the job, the greater should be the manager's operator's allowance or imputed labour costs. This is rarely considered in Asian smallholder dairy farming.

This COP analysis includes finance costs on borrowed money. There are other measures of farm profit, discussed in Chapter 11, that do not take into account such finance costs. It is the choice of the farm adviser as to whether interest on loans is included as a cost of producing milk on Asian smallholder farms. Because they can constitute a major cash outlay each year for smallholder farmers, they should be included in his annual financial commitments and future farm budget projections. Consequently, they have been incorporated into this particular COP analysis. This decision highlights the importance of clearly describing the particular components of any financial analyses so the reader is clear as to exactly what is and what is not included in the final 'bottom line' measure of COP. Unfortunately, this is rarely the case, leaving the reader unsure as to how such data can be interpreted, and importantly, compared with other COP estimates undertaken by other dairy farm management specialists, probably using different methodologies.

Fuel and oil are normally included in the feed costs although some farm economists consider repairs and maintenance of farm machinery as an overhead rather than a variable cost. It doesn't really greatly matter so long as it is only included once.



**Figure 9.2** Home-grown grass is usually the cheapest and most nutritional forage source for milking cows (Central Vietnam)

FAO (2008a) recently documented the enormous wastage of milk in some African countries, through loss to spillage or spoilage between the farm and consumer, with losses as high as 20–25%. As these losses occurred outside the farm, they are not relevant to the farmer. However, they do introduce the possibility that not all milk collected from the cows may be accounted for in farm gate sales or consumption by the farm family. For example, it may have been spilt while milking the cows, during the process of being bulked into containers for transport, or even during transportation to the collection centre. In addition, some could have become soured through poor and lengthy on-farm storage, hence rejected prior to transport. If such milk requires farm inputs for production and harvesting, then it should be included as a farm cost, even though it did not generate farm income or nutrients for the farm family. This is rarely, if ever, included in farm financial analyses but should be, when relevant. Milk fed to calves should also be taken into account, although such milk indirectly generates dairy income through calf growth.

Some economists include personal (household) expenses in the farm costing rather than family labour. This does not allow for inclusion of any personal profit in the financial analyses, which is not the same as farm profit.

As dairying is frequently just one of the enterprises on many smallholder farms, it is important to only consider the costs relevant to, and the income generated from, the dairy enterprise. Such apportioning of farm finances is often not easy because labour units, machinery and farm facilities are frequently used for a diversity of farm enterprises. In addition, if feed for any dairy animals (young stock as well as adult cows)



**Table 9.1** Categorising farm costs on smallholder dairy farms

Category		Detail
Variable costs	Herd & shed costs	<ol style="list-style-type: none"> <li>1. Artificial insemination: inseminator, semen, drugs associated with reproductive management</li> <li>2. Young stock: raw milk or calf milk replacer, concentrates and roughages and herd management to point of calving</li> <li>3. Animal health: veterinarian visits, drugs, vaccines and drenches</li> <li>4. Milk harvesting: rubber liners, detergents and sanitisers, maintenance of milking machines, hot water, transport to milk collection centre, cooperative commission</li> </ol>
	Feed costs (for milking and dry cows)	<ol style="list-style-type: none"> <li>1. Purchased concentrates: formulated or ingredients</li> <li>2. Purchased forages: grass, roughage by-products</li> <li>3. Home-grown forages: fertilisers, irrigation, processing/storage, weed and pest control</li> <li>4. Machinery: fuel and oil, repairs and maintenance</li> </ol>
Overhead costs	Cash overhead costs	<ol style="list-style-type: none"> <li>1. Paid labour</li> <li>2. Finance: interest, bank fees</li> <li>3. Farm: rates, rent</li> <li>4. Administration: office equipment, insurance, telephone, other</li> </ol>
	Imputed overhead costs	<ol style="list-style-type: none"> <li>1. Family labour, such as operator's allowance</li> <li>2. Depreciation</li> </ol>

Dairy enterprise costs are presented graphically in Figure 9.3.

is produced from a cropping enterprise on-farm, such as rice straw or maize stover, it should be given a cost to the dairy enterprise.

The total COP is then the sum of all farm costs included in Table 9.1. Unfortunately one still finds published estimates of COP for smallholder dairy operations that do not include family labour and finance costs. These create a false assessment of the true costs of dairy farming, and if used as a basis for government policies for dairy development and even milk prices (as in some countries), they do not paint the true picture of the economics of smallholder dairy farming.

### 9.2.1 Cost efficiency indicators

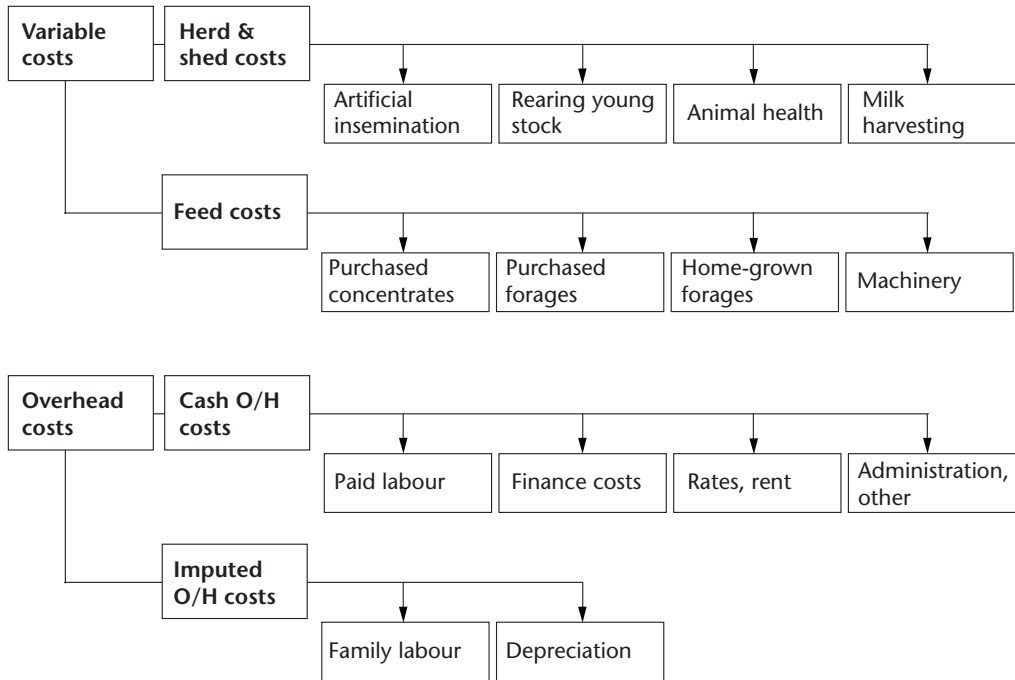
Further analyses of farm costs can provide some key performance indicators (KPIs) as to how efficiently the farm is operating. Target values of these KPIs vary with different dairy production systems and countries.

$$\text{Feed cost ratio (\%)} = \frac{\text{Total feed costs}}{\text{Total farm income}} \times 100$$

$$\text{Variable cost ratio (\%)} = \frac{\text{Total variable costs}}{\text{Total farm income}} \times 100$$

$$\text{Overhead cost ratio (\%)} = \frac{\text{Total overhead costs}}{\text{Total farm income}} \times 100$$





**Figure 9.3** Farm costs for smallholder dairy farms

$$\text{Finance cost ratio (\%)} = \frac{\text{Finance costs}}{\text{Total farm income}} \times 100$$

$$\text{Production cost ratio (\%)} = \frac{\text{Total cost of production}}{\text{Total farm income}} \times 100$$

### 9.3 Increases in farm revenue

Farm revenue comes from three main sources, namely:

1. Farm income, which originates from the sale of produce, the consumption of farm produce by the farm family, non-cash income (such as livestock inventory) and dividends from dairy cooperatives.
2. Sales of capital items, such as land, machinery and other items which are not a normal product of the farm's business.
3. Money from credit organisations or other farm-related organisations, such as banks, lending agencies and dairy cooperatives.

Off-farm employment and household receipts not derived from farming are not classified as farm income. Farm revenue can also be called farm returns, but the former word is preferred because of the frequent use of 'return' as a ratio of farm efficiency (see Chapter 11).

### 9.3.1 Farm income generated by farm produce

Smallholder farmers generate income from their dairy enterprise in a variety of ways, either as cash or non-cash (that is imputed) income.

Cash income originates from the sale of their enterprise products, such as:

- Raw milk
- Value added dairy products
- Cull cows
- Excess dairy stock, such as bull calves
- Dairy stock specifically grown out for beef
- Manure
- Excess fodder
- Grass cuttings for planting material
- Biogas, from dairy effluent.

Imputed income originates from assets that would generate finance following their sale, such as livestock or land.

Regular monthly records should be kept to ensure accurate recording of sales of farm produce. Aspects of the sale of raw milk are also discussed in Chapter 6.

### 9.3.2 Imputed income from stock inventories

The value of the dairy herd (adult and young stock) does not remain constant from year to year, but varies depending on changes in stock numbers and the unit value of each category of stock. Stock numbers can vary as a result of purchases, sales, births and deaths. Sales can be due to culling excess, sick or underperforming stock, while some stock sales arise from planned programs such as growing out male dairy beef stock to target live weights or ages. The unit value of stock is usually their cost if they were purchased in the marketplace. It is also possible that stock still owned by the dairy business has been moved off-farm, for example for agistment.

As most of the stock remains on the farm for several years, sometimes many years, their changing value does not generate any cash. In other words, their value is imputed from year to year. As with changing land values, this is a form of indirect income and is an asset to the dairy business. Therefore, it should be taken into account when assessing both the value of, and the income generated from, the dairy enterprise. Such calculations are usually undertaken once each year when business managers review their annual performance and plan future farm activities and development programs.

Stock on a dairy farm can be classified in various ways as in Table 9.2, with each class of stock being given a unit value, usually at the beginning of each financial year, when farm accounts are finalised. A common method of classification on Australian dairy farms is:

- Adult cows (milking and dry cows) which have had a calf. This includes first calf heifers.
- Yearlings (heifers older than 12 months) yet to have a calf.
- Heifers (3–12 months of age).

**Table 9.2** Typical livestock schedule for developing a stock inventory

	Number	Value	Total		Number	Value	Total
<b>Opening stock</b>				<b>Sales</b>			
Cows				Cows			
Yearlings				Yearlings			
Heifers				Heifers			
Calves				Calves			
Bulls				Bulls			
<b>Births</b>				<b>Deaths</b>			
<b>Purchases</b>				<b>Closing stock</b>			
Cows				Cows			
Yearlings				Yearlings			
Heifers				Heifers			
Calves				Calves			
Bulls				Bulls			
<b>TOTAL</b>				<b>TOTAL</b>			

- Calves (0–3 months of age).
- Bulls (older than 12 months) including steers, used for either breeding or grown out for slaughter.

This stock inventory comprises two sources of revenue:

- Stock trading account as cash from actual sales and purchases of dairy stock.
- Imputed from changes in value of the entire dairy herd.

On established dairy farms where herd numbers are relatively stable, stock trading accounts can form a large source of farm revenue, as there is a normal turnover of stock, through selling bull calves and cull cows, and using the natural increase of the milking herd to generate replacement heifer calves. However, on newly developing farms, purchasing yearling heifers or adult cows can be a major investment, particularly in countries with government policies of importing high genetic merit dairy heifers from established dairy industries. On smallholder farms, with relatively small annual milk receipts, such large purchase costs can greatly reduce annual cash profits, but this is compensated by a corresponding increase in stock inventory value.

Imputed income can also be generated from changing land assets. However, the land must be owned to be part of the farmer's equity, although any change in area of land farmed, or its unit value, is an asset to the dairy business enterprise. Rented or leased land, although an asset to the farmer, is not part of his equity, so cannot generate imputed revenue.

### 9.3.3 Farm income from creditors

Creditors or lending agencies make value judgements when deciding to provide loans to farm businesses. They must decide the risk in lending the money and then structure the loan around that risk. It is up to the farm business to present the case in a professional way to maximise the success rate of the application and minimise the costs in sourcing the loan. The relevant documentation is discussed in Chapter 10 with an example set of financial statements presented in Appendix 6.

Interest on loans can vary tremendously and is often expressed in various ways. For example, interest rates can be as low as 5% per annum in some countries or as high as 1.5–2% per month (equivalent to 18–24% per annum) in others.

Having debt is part of operating most businesses. Its effective use is important in the creation of farm wealth over the long term. Ineffective use of debt can pose a significant risk to wealth creation. Business managers need to ask the following key questions:

- Is my level of debt a problem in the long-term survival of my business?
- Can my level of debt be better managed to improve my financial security?
- If so, what are my options to restructure my debts?

The options available depend on the farmer's goal and priorities, whether risk or serviceability are the key issues and what level of risk the farmers and creditor are most comfortable to work with. In general, low risk investments offer low returns, while investments with higher potential returns also come with high risks. The other important issue is the ability of the business to service debt repayments without affecting its requirements for working capital. In other words, debt may threaten the business's profitability and viability if debt servicing means it cannot purchase variable inputs when they are needed.

Farmers should not consider selling off working assets to repay debt, for example milking cows, because this reduces both their equity and the rate at which they can repay the finance costs and eventually the debt.

The ability to repay farm loans can best be answered by preparing two key documents, a balance sheet and a cash flow statement (Dairy Australia 2005). Balance sheets provide guidelines on whether the assets are fully committed as security or there is capacity for additional borrowings. Cash flow statements show the money flowing into and out of the business, to analyse the management of cash. Both are discussed in Chapter 10.