11

Measures of farm profit

This chapter introduces three different measures of farm profit and presents ratios to assess business health.

The main points in this chapter

Profit can be expressed in three ways: cash, efficiency and wealth creation.

- Does the farm generate enough cash to pay the bills, repay the loans and reward the farmer for his work? This is quantified using cash operating surplus and milk gross margin?
- How efficiently are the farm resources being used, both the total farm assets and what the farmer actually owns? This is quantified using return on assets and return on equity?
- Does the farmer own more this year than he did last year? This is quantified by using change in net worth?
- By understanding the major influences on farm profit, greater attention can be paid to them. These are both external (largely outside the farmer's control) and internal (under the farmer's control).
- Business health can be assessed using a set of four financial ratios, which monitor liquidity, solvency, profitability and efficiency of business performance.
- Two examples of computer software to quantify farm profits are presented, both of which are available, at no cost, from the author.

In order to improve profit, it must first be measured. Most farmers think of profit in terms of cash or money left over from income after deducting all the costs involved in earning that income. In other words, to them profit generally refers to some surplus of income over costs, or in economic terms, the difference between the gross income and the operating costs. This may be the simplest measure of profit, but it is not necessarily the best. Profit can be expressed in three ways.

1. Cash. Does the farm generate enough cash to pay the bills, repay the loans and reward the farmer for his work? This can be expressed by a range of indicators such

as cash operating surplus, milk income less feed costs, milk gross margin or economic farm surplus.

2. Efficiency. How efficiently are the farm resources being used? For a general overview of the business performance, this is expressed as return on assets, while for a more detailed assessment of what the farmer actually owns (namely his equity), a more suitable measure is return on equity.
3. Wealth creation. Does the farmer own more than he did last year? This is expressed as capital gains or more suitably as the difference between the two years' equity.

11.1 Quantifying cash and non-cash profit

The simplest measure of cash profit is cash operating surplus (COS) which quantifies the sum of all the cash flows on the farm.

$$\text{COS} = (\text{farm cash income}) - (\text{farm cash costs})$$

Milk income less feed costs (MIFC) is a useful measure of cash profit because it is relatively easy to measure and provides a guide to how well the cows are being fed. It does not take into account the costs of feeding the non-productive stock on the farm, namely the dry cows and replacement heifers.

$$\text{MIFC} = (\text{milk income}) - (\text{feed costs for milking cows})$$

Another way to quantify cash profit on dairy farms is to use the milk gross margin (MGM). This calculates the income from milk sales less the variable costs to produce that milk.

$$\text{MGM} = (\text{milk income}) - (\text{variable costs})$$

The most sophisticated methods to quantify farm profit, uses non cash farm income (changes in stock and land values) to calculate gross farm income (GFI) first, and then non cash farm costs (imputed labour and depreciation) to calculate net farm income (NFI).

$$\text{GFI} = (\text{Total farm cash income}) + (\text{changes in stock inventory})$$

$$\text{NFI} = \text{GFI} - (\text{variable} + \text{overhead cash costs \{excluding finance costs\}} + \text{imputed costs})$$

Net farm income is also known as economic farm surplus (EFS) or operating profit. Operating profit does not include finance costs because these are the cost of acquiring the services of the assets used, and are not directly related to their performance. Earnings Before Interest and Tax (EBIT) is sometimes used as a measure of NFI, this being a relatively new term in farm management economics, and is defined as farm revenue less farm expenses before the payment of interest on loans and income tax.

There are three different descriptions of profit which require some explanation. Operating profit describes the return to all capital, and by removing finance costs it

becomes the return to the farmer's equity, so quantifies his net profit. Finally, subtracting his income tax from the net profit quantifies his growth in equity or addition to wealth.

Break-even milk price is another way of expressing farm profit. It is the indicative milk price required to cover the cash costs of production, but not principal repayments and any capital expenditure. It also excludes other farm income, just dealing with milk production. When compared to the farm gate milk price received, the difference provides a measure of the profit or loss incurred by the farmer on a per kg milk basis.

11.2 Quantifying change in farm efficiency

The term 'capital' refers to all the farmer's production resources. The most important are land, buildings, improvements (such as built-up soil fertility and irrigation), machinery, stock, fuel, labour management skills and credit. Many of these could be converted to cash by selling them. The cash sum available from their sale is the farm assets. After paying off any debts owed on the farm, they are the farmer's own capital, his net worth or his equity. Total assets are a good measure to compare the business performance of that farm with others of similar size of operation, however, a more meaningful measure for that farmer relates to his total equity in the farm.

The market value of the total resources on the farm is sometimes known as the total capital of the farm. This is calculated by summing the market value of the land, improvements and animals, plus the machinery and feed reserves. With the numerator net farm income, return on assets (ROA) is calculated as follows:

Figure 11.1 Good quality forage in a well-designed shed: the essence of profitable smallholder dairy farming (Sabah, Malaysia)

$$\text{ROA (\%)} = \frac{\text{Net farm income}}{\text{Assets}} \times 100$$

This calculation takes no account of debts owed so quantifies the earning rate of the total bundle of resources employed in the business. In practice, the farmer has to manipulate the total resources under his control, not just those which are debt free. ROA provides a guide to those responsible for the use of capital (this could be an individual, a cooperative or a government department). It also allows the performance of this capital, invested as it is, to be compared with alternative possible investments.

As the farmer probably does not own all the farm assets, he is more interested in how efficiently he is using his own assets. The farmer's equity is calculated by adding the market value of all the resources he owns, then subtracting it from a total of all the money he owes (his liabilities). Equity, expressed in monetary terms, quantifies the net worth of the farmer. However, it is usually expressed as a percentage, calculated as follows:

$$\text{Equity (\%)} = \frac{\text{Assets} - \text{Liabilities}}{\text{Assets}} \times 100$$

Expressing the farm's annual profit, after paying interest and taxes, as a percentage of this capital, is one measure of the effectiveness of the management of the farm's resources. As the calculation does not take into account any debts, it must also exclude the finance costs associated with these debts. The return on equity (ROE) is then calculated as follows:

$$\text{ROE (\%)} = \frac{\text{Net farm income} - \text{finance costs}}{\text{Resources owned}} \times 100$$

The ROE measures the farmer's effectiveness as a combination of annual inputs such as labour, irrigation, fertilisers, machinery and other resources used to operate his dairy enterprise. It also quantifies the rate of earning of his capital committed to his farm relative to the rate of earning if it were used in some other income generating enterprise.

Calculating his ROE shows the farmer how efficiently he is running the annual operations of his farm business. If it is very low, the farmer should consider alternatives by asking the questions:

- Can he increase his ROE by using better farming methods, borrowing extra money to improve production or diversifying my farm enterprises?
- Should he transfer his capital from this farm and move to a different locality where it is likely to be higher?
- Should he sell up and move into another form of investment?
- Is his ROE low because there has been a large increase in value of his assets?
- Should he use his increased equity to borrow more money to further develop his farm and earn more income?

The more rapid the annual increase in asset worth, the more difficult it is to maintain a constant ROE. An increase in asset value provides more collateral against which to borrow to invest in the operation to increase farm income. It can also mean an increase in land tax, hence greater farm costs.

A useful measure of farm efficiency is asset turnover (also known as financial efficiency) which quantifies how well the farm assets are being used to generate farm income.

$$\text{Asset turnover (\%)} = \frac{\text{Gross farm income}}{\text{Assets}} \times 100$$

Another useful measure of farm efficiency is profit margin which is NFI expressed as a percentage of total farm income. This quantifies the proportion of farm income kept as operating profit, or the amount of profit generated in each dollar (or local currency unit) of revenue.

$$\text{Profit margin (\%)} = \frac{\text{Net farm income}}{\text{Gross farm income}} \times 100$$

Gearing is another term describing business risk, and measures the ratio of debt to equity that makes up total capital. If other people's money costs less than the rate at which money grows in the business, then borrowing is a good business decision. The benefit of gearing is that the owner's capital can grow faster than would be the case if he relied solely on his own resources. However, this does not take into account the principle of business risk. If the farm makes an operating loss instead of a profit, the farmer's net worth will decline. The likelihood of business risk grows with farm debt because the chance of losses increase. Accordingly, lenders generally charge higher interest rates, which could further increase the size of any losses should they occur. This is very relevant with farming because of the variability of the seasons in different years. Expressing it simply, a heavily geared investment grows faster, if 'things go well' but if 'things go badly', it loses value faster.

The leverage (or gearing) ratio then describes the extent to which equity has been multiplied by the use of debt. A highly levered (geared) business offers higher returns when it is performing well but will also increase losses when it is performing poorly, when carrying a greater financial risk.

$$\text{Leverage ratio (\%)} = \frac{\text{Liabilities}}{\text{Equity}} \times 100$$

The solvency ratio describes the degree of debt per unit of assets. The higher the value, the greater the degree of business risk. The inverse of this ratio, the debt to asset ratio, can also be used to describe business risk.

$$\text{Solvency ratio (\%)} = \frac{\text{Liabilities}}{\text{Assets}} \times 100$$

$$\text{Debt to asset ratio (\%)} = \frac{\text{Assets}}{\text{Liabilities}} \times 100$$

Other measures are available to assess the relative risk of the dairy enterprise. The interest cover quantifies the ability of the farm to repay interest bills (but not any principal repayments).

$$\text{Interest cover (\%)} = \frac{\text{Finance cost}}{\text{Net farm income}} \times 100$$

The debt to income ratio quantifies the ability of the farm to repay both interest and principal.

$$\text{Debt to income ratio (\%)} = \frac{\text{Total liabilities}}{\text{Gross farm income}} \times 100$$

Calculations for mixed farming

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

11.3 Quantifying wealth creation

Increase in the capital value can occur simply from a rise in market value of the land. It may also increase by well chosen investments on-farm, such as developing an irrigation system or purchasing high genetic merit breeding heifers. It is calculated by deducting the cost of capital investments made from the total increase in value of the assets over a given period, usually 12 months. There is no direct cause and effect relationship between capital investment and capital gain. For example, an expenditure of $1000 on renovating a farm building does not necessarily mean that the value of the farm will rise by $1000, as they may not suit the plans of a prospective buyer, hence be valued by them at much less.

Since farm assets can be owned outright by the farmer, or a proportion of it is still owned by the lending agency, capital gain is usually expressed as change in equity (or net worth).

$$\begin{aligned}\text{Change in net worth} = &\ (\text{equity value of farm assets in Yr 2}) \\ &- (\text{equity value of farm assets in Yr 1})\end{aligned}$$

This could be considered as the 'ultimate' measure of farm profit because business wealth can usually be added to personal profit to create personal (and family) wealth, one of our major motivators to 'go to work' each day. Figure 11.2 presents a flow chart of the various measures of profit discussed in this chapter.

Livestock as capital investment

Livestock are capital assets, namely something that has been produced but has not yet been used up. It should produce a return, in terms of increased income, or welfare, in the future. Livestock fit this definition because they have been produced and should yield returns directly in the form of meat, milk and hides/skins, and indirectly through manure or draught power used in raising income from crops.

Investment is the acquisition of capital assets. It necessitates saving, or forgoing current consumption. The consumption forgone may be agricultural produce, such as eggs from poultry, or stock retained for breeding. The money used to purchase stock or

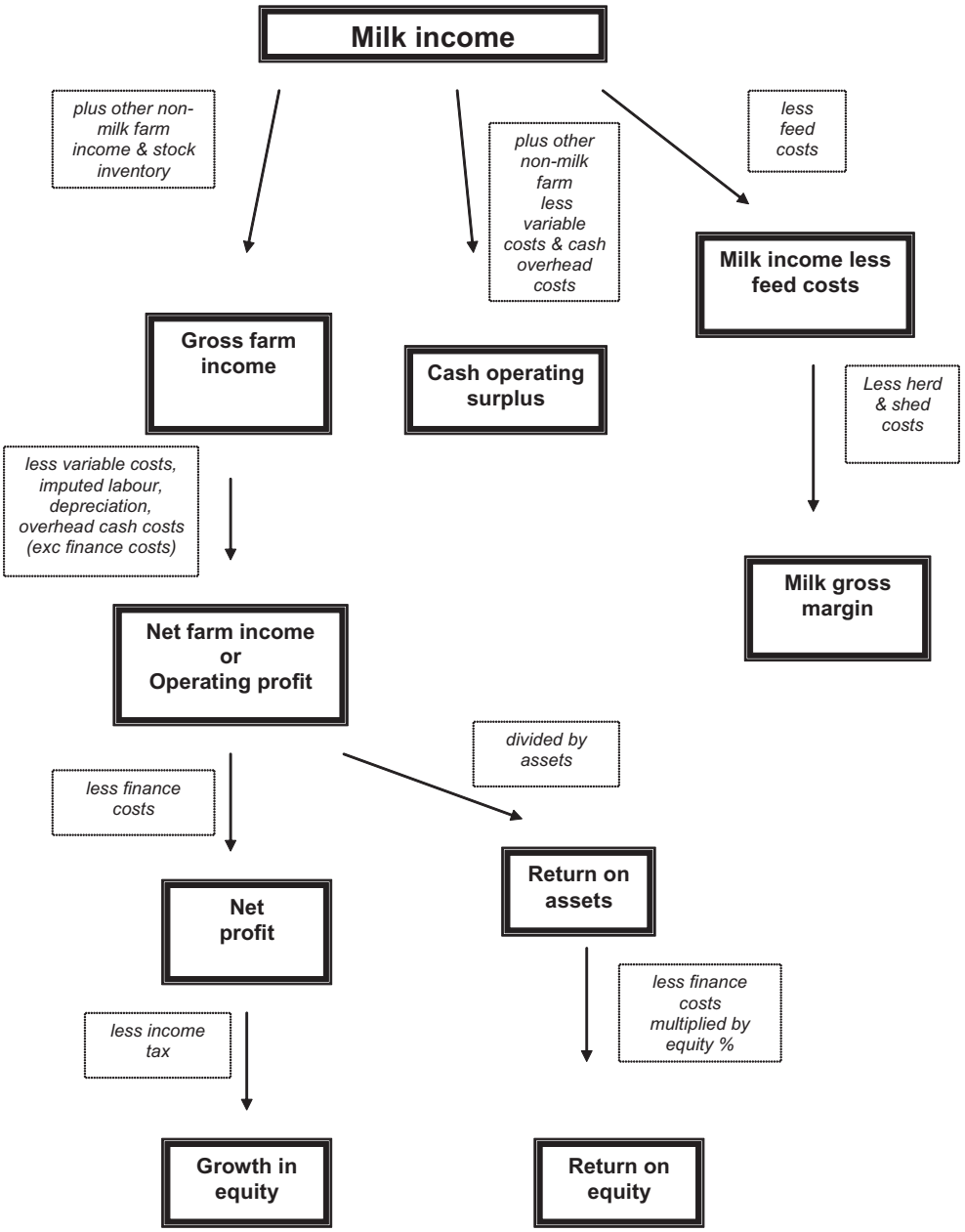

Figure 11.2 Flow chart of measures of farm profit on smallholder dairy farms

equipment might otherwise have been used to buy food or other consumed goods. If the asset is acquired on credit, then someone else has done the saving and may require 'interest' to be paid on the loan.

Investments in livestock have very low transaction costs, once the first breeding female has been acquired, and mated, since herd growth follows from reproduction.

Figure 11.3 A well-grown heifer (standing), 2 years and 4 months old, in calf, on a very profitable smallholder farm in North Vietnam.

11.4 Drivers of profit

By knowing the major influences on farm profit, greater attention could be given to these. These are called the key profit drivers. With greater knowledge about how they operate, it is even possible to create computer models to assess their relative importance.

There are external profit drivers over which the farmer has minimal influence:

- Milk price, although milk quality and composition has an influence.
- Interest rates for farm loans, although these could be reduced with higher equity.
- Price of purchased feed, both concentrates and forages.
- Price of stock, such as replacement cows.
- Cost of labour, both paid and imputed.

The following farm activities are considered operational and contribute to profit through improved management which increases output per unit input. These are called the internal profit drivers:

- Cows, through increased milk yield per cow.
- Feeding (home-grown and purchased feed) by increasing milk income above feed costs.
- Reproduction, through increased calves born per cow bred or reduced inseminations per conception.
- Health, through reduced veterinary costs per heifer reared or cow milked.
- Longevity of milking cows, which increases the number of lactations or reduces culling rate.

Figure 11.4 Good farm records help plan farm management in South Vietnam. On this farm they use a reproductive 'wheel' to monitor the expected dates of cow calvings.

- Replacement heifers, which reduces calf mortality and heifer wastage rate.
- Land, by increasing forage production per ha.
- Labour, by increasing cows per labour unit or reducing the hours of labour per cow milked.
- Overheads, by increasing milk produced per unit overhead costs.

The above emphasises the importance of paying close attention to each of the nine links in the supply chain of a profitable dairy enterprise (see Figure 2.3 on page 22). In addition, many of these profit drivers have been highlighted in Chapter 14.

Farm profit should be considered separately to personal profit. For wage earners, personal profit is money left over from wages after paying all the household expenses. Wage earners generally do not use any of their personal assets, except their work skills. Farm profit, on the other hand, is excess wealth, in terms of both cash and assets, generated by the dairy enterprise within the farm business.

There is no single best measure of farm profit. For example, it is possible for ROE to fall while the cash profits actually increase, due to a sharp rise in land or stock values. It is then important for farm profits to be quantified using several of the above measures.

11.5 Assessing the business 'health' of Asian smallholder dairy farms

Just as a doctor examines our symptoms to judge our overall health, farmers can look at records of a business to assess its financial health, both now and to some extent in the

future. It is obviously too late to correct what has happened in the past, but decisions can be made from past trends to steer the business towards its financial objectives. This examination uses various ratios taken from the financial statements to illustrate trends over time. One year's figures have limited use, but a series of these figures over time shows where the business is heading and helps make decisions to alter course, if need be. Many of these ratios have been discussed in this and previous chapters. They can be grouped into various categories to provide the necessary indicators of business health. There are four main categories, namely liquidity, solvency, profitability and efficiency (Blokland 2003).

For each of the 25 ratios listed below, there would be recommended values above or below which farmers need to be concerned. Such values may be available for dairy farms in developed countries. Because many of these ratios have only become relevant for farms in South and East Asia over the last decade, they have yet to be quantified for Asian smallholder dairy farmers. Guidelines then need to be sought from local dairy specialists firstly, as to which are relevant to Asia and secondly, what their threshold value might be. This is an exhaustive list, so it is up to readers to select the most appropriate ones for their specific purposes.

A word of caution about financial ratios: From this and previous chapters, it is apparent that the same formula can be given different names (such as NFI, operating profit and EBIT). It also follows that the same financial measure can sometimes have a different formula. So, before simply accepting the financial measure as being the most relevant to the needs of the analyses, it is important to check that the formula accurately quantifies these needs.

Most agencies throughout the world, be they government or private, have developed computer programs to assist with documentation of raw data and calculation of financial indicators of the business health of dairy farms or enterprises. To ensure consistency of data input, each agency must have a series of definitions for each farm costs and income sources as well as descriptors of each financial indicator calculated by the computer program. One excellent example of such a service provided free of charge to every dairy farmer in the country is Australia's 'Taking Stock' program (Dairy Australia 2005).

11.5.1 Liquidity

Liquidity is a short-term concept showing the ability of the business to meet debts when they become due. It indicates potential financial troubles. The three main indicators are:

1. Debt structure ratio, see Chapter 10.1.4
2. Working capital, see Chapter 10.1.2
3. Debt to asset ratio, see Chapter 10.1.4.

11.5.2 Solvency

Solvency is a long-range concept which shows the ability to meet all debts when assets are sold. The five main indicators are:

1. Net worth or equity, see Chapter 10.1.3

2. Leverage ratio, see Chapter 10.1.4
3. Solvency ratio, see Section 11.2
4. Debt to asset ratio, see Section 11.2
5. Debt to income ratio, see Section 11.2.

11.5.3 Profitability

The main indicators and ratios are derived directly from the income statement discussed in Chapter 10.

1. Net farm income, see Chapter 10.3.1
2. Off-farm income. This originates from non-farm jobs and custom work on other farms
3. Net income shows what is available to pay for principal repayments, new farm investments, family living expenses and family off-farm investments. Net income is the 'bottom line' of the business and arguably the single most important indicator of profitability. It becomes more important as off-farm work becomes more available.

$$\text{Net income} = \text{NFI} + (\text{Off-farm income}) - (\text{income tax})$$

4. Change in net worth, see Section 11.3
5. Profit margin ratio. This is also a measure of business efficiency

$$\text{Profit margin ratio (\%)} = \frac{\text{Net farm income}}{\text{Gross farm income}} \times 100$$

11.5.4 Efficiency

These measure various relationships between farm inputs and outputs, expressed as ratios, either physical or financial. Financial efficiency measures the degree to which the farm uses its assets to generate income and the degree to which management controls expenses in relation to sales.

1. Physical measures, such as kg milk/cow/d or kg milk/kg concentrate fed
2. Asset turnover or financial efficiency, see Section 11.2
3. Return on assets, see Section 11.2
4. Return on equity, see Section 11.2
5. Operational ratios. These compare major expenses and net farm income to gross sales.

   a. $$\text{Operational expense ratio} = \frac{(\text{Total expenses}) - (\text{depreciation} + \text{interest})}{\text{Gross farm income}} \times 100$$

   b. $$\text{Depreciation expense ratio} = \frac{\text{Depreciation}}{\text{Gross farm income}} \times 100$$

   c. $$\text{Debt to income ratio} = \frac{\text{Liabilities}}{\text{Gross farm income}} \times 100$$

d. $$\text{Interest expense ratio} = \frac{\text{Interest}}{\text{Gross farm income}} \times 100$$

e. Profit margin ratio, see Section 11.2

f. $$\text{Variable cost ratio} = \frac{\text{Variable costs}}{\text{Gross farm income}} \times 100$$

g. $$\text{Overhead cost ratio (\%)} = \frac{\text{Overhead costs}}{\text{Gross farm income}} \times 100$$

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

11.6 FEEDPROFIT and FARMPROFIT, two computer programs to quantify farm profits

FEEDPROFIT is an Excel spreadsheet, written by the author in collaboration with Daniel Nugraha (an Indonesian dairy adviser), which calculates the MIFC for a milking herd. The range of feeds available and their nutritive value are typical of those in Indonesia, but these can be replaced with local data to modify the program for other countries. FEEDPROFIT.xls calculates the nutrient requirements to achieve target milk yields then, from a local feed database, presents the cost of a selected ration and the MIFC achieved.

FARMPROFIT is an Excel spreadsheet, written by the author in collaboration with a team of Vietnamese dairy advisers, which tabulates all the costs and returns for a smallholder dairy farmer, to produce a series of key performance indicators of farm profit. These include measures of cash and non-cash profit, farm efficiency and wealth creation and cost of production (per kg milk), all in Vietnam Dong (VND). However FARMPROFIT.xls can be easily converted into local finance units for use in other countries.

Both FEEDPROFIT and FARMPROFIT are available at no cost from the author, Dr John Moran, at john.moran@dpi.vic.gov.au or jbm95@hotmail.com.