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LEARNER GUIDE

FARM MANAGEMENT

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KEY TO ICONS

	Individual **Formative** Assessment: These activities have to be completed individually in the PoE workbook.
	Group **Formative** Exercise: These activities have to be completed as a group in the PoE workbook.
	Summative Assessment: This icon indicates that the learner must complete the summative exercise in the PoE workbook.
	Important Information: These notes highlight key pointers

CHAPTER 1

PRODUCTION SYSTEMS AND PRODUCTION MANAGEMENT

In this chapter we explore the following concepts:

- Goals and objectives in
- Agri-Business
- Production Systems
- Market interaction
- Natural resource limitations
- The interactions between agricultural processes and environmental factors
- Optimum use of resources for optimum outputs
- Production plan
- Managerial tasks of production managers

GOALS AND OBJECTIVES IN AGRI-BUSINESS

BUSINESS GOAL SETTING

"Begin with the end in mind". This is a well-known phrase, which expresses the importance of starting off any project with a picture of how things should look once the work has been successfully completed. For large scale and long-term undertakings, this picture is referred to as the vision. For smaller and shorter scale operations, this picture takes the form of specific outcomes and is commonly referred to as objectives or goals.

A vision can be seen as a farmer's dreams in action. It is the situation that the farming business strives for in the future, having a clear picture of how the farming business will change over time.

It is important that the farmer is familiar with the opportunities and threats in the national and international environment, as well as knowing the abilities and potential performance of his farming business.

Strengths, weaknesses, opportunities and threats are usually identified in the following areas of a farming business:

- Workforce
- Technical resources
- Financial information
- Natural resources
- Water
- Pastures
- Infrastructure
- Location of the farm

This is called a **SWOT ANALYSIS.**

STRENGTHS – **W**EAKNESSES – **O**PPORTUNITIES – **T**HREATS

STRENGTHS	**WEAKNESSES**
Strengths are within an organisation. It will look at products, processes, human resources, infrastructure, structures, administration, marketing, public relations and financial issues. These are all issues over which the farmer has control and that are working well and therefore contribute to the success of the farm.	Weaknesses are within an organisation. It will look at products, processes, human resources, infrastructure, structures, administration, marketing, public relations and financial issues. These are all issues over which the farmer has control but are not working well and undermine the farm's potential success.
OPPORTUNITIES	**THREATS**
These could be in any area, both internal and external. It could be improvements to internal systems to take advantage of a marketing opportunity. It could be an opportunity to upgrade equipment. Often the opportunities are identified through asking: 'How do we take advantage of our strengths?' ;'How do we overcome our weaknesses?' and 'What can we do to mitigate this treat?'	Threats are external forces over which the farmer has no control, but, by being aware of these issues, he can plan for a range of eventualities. The issues raised in this section also, therefore, can become key areas for development / improvement.

An example of a **SWOT** analysis is as follows:

Strengths	**Weaknesses**

• Product quality
• Early maturity
• Secure and plentiful water
• Excellent soils
• Good range of high quality plant material
• Committed ownership
• Good technical production skills
• Good PR skills – well connected
• Labour plentiful
• Close to port / airport
• Innovative management
• Low per unit labour costs
• Labour literacy high (100%)
• Good market potential
	• Labour skills poor
	• Imports of inputs difficult and costly
	• No EurepGap (environmental) compliance
	• No local factory outlet
	• Poor quality and unreliable machinery
	• Packhouse in bad condition
	• No regular management accounts
	• No market access to key markets
	  ○ Japan
	  ○ USA
	• High pest pressure
	  ○ Pests (identified and specific)
	• Low export percentage
	• Lack of available logistics to exploit early maturity of produce

Opportunities	**Threats**

• Expand production an identified and specific commodity into market gaps left by other farmers who no longer produce
• Reduce electricity costs
• Obtain EurepGap (environmental) accreditation
• Improve labour skills through training
• Upgrade equipment reliability
• Improve systems
  ○ Production and packing records
  ○ Human resource
  ○ Finance and reporting
  ○ Marketing
• Explore market niche opportunities
• Investigate lime production
	• Water availability
	  ○ Floods – medium risk
	  ○ Drought – low risk
	• Phytosanitary pests and diseases
	  ○ Identified and specific list
	• Management succession
	• Labour unrest
	• Political unrest
	• Security
	• Low market prices
	• Environmental requirements
	• Lack of management depth

• Investigate local processing • Gain access to Japan • Improve nutritional management	

SETTING GOALS AND OBJECTIVES

Goals and objectives are necessary to convert the vision of the farm into measurable performance areas.

Long term goals indicate a desired outcome or milestone which the farming business is striving to achieve in the future.

When formulating long-term goals, it is important that the number of goals should be limited to about three to five.

Areas to pay attention to in formulating long term goals are:

- The farming business's growth
- Business performance
- Sustainability
- Succession

When formulating short-term objectives, the following questions must be answered: **WHAT** must be done, at which **STANDARD** and **WHEN**?

Short term objectives are formulated to give guidance and set targets that the farming business should achieve, within one year or one production season.

Without clear objectives, the farmer will not know where the farming business is headed, nor how well it is performing.

Short term objectives have the following characteristics:

S – Specific

M – Measurable

A – Agreed upon by all stakeholders

R – Realistic or achievable

T – Time schedule

Some goals and objectives encompass a variety of challenges the most important of which are to:

Achieve per hectare yield targets – This means that the production per hectare must achieve the targets that have been set in the annual budget. Annual targets would vary from enterprise to enterprise.

Ensure the end products meet market specifications – The production manager must for example set production objectives to achieve the requirements of the markets. This could be in terms of size, colour or internal quality.

Ensure that the process is sustainable - This means ensuring that the environment is not adversely or unnecessarily disturbed by the production processes, for example by pest control chemicals, fertilisers etc., so that high levels of production can be sustained over the lifetime of the production area or enterprise.

Remain within the framework of Good Agricultural Practices (GAP) – GAP calls for care in the use of chemicals to ensure safety for all operators, the use of pesticides, fungicides and fertilisers in a systematic, careful and planned way, and the judicious application of water to prevent wastage, contamination and erosion.

Secondary objectives may apply to individual farming operations, but meeting the objectives stated above will ensure the overall success of the operation.

In order for it to be successful, goal setting requires open communication, motivation and the complete buy-in and understanding of the farm's objectives by everyone working on the farm.

It is important that when goals are set for the farm, there is an alignment between the goals for each agricultural system and the agricultural enterprise. If for example, the vision for your farm is to develop the farm for tourism, most of the activities on the farm should be directed towards achieving this overall goal.

Goals would maybe include developing a pet farm, having tractor driving fun days on the farm or maybe developing a picnic spot.

Long-term goal: POSITIVE Re:Ro(Re>Ro)Increase Re			
Main strategy (how?): Increased reproduction levels			
Short-term objectives ---Livestock			
Lambing procedures 135% Weaning percentage 130% Weaning weight 44kg			
Spring mating/Autumn Lambing – Dual-purpose sheep flock (3000 ewes – 4848 SSU)			
WHAT	**ACTION**	**BUDGETED STANDARDS**	**WHEN**
Testing rams	Fertility tests	Sperm mobility (>90%)	May
	Mating dexterity	Interest in ewes Mating performed with libido and success	During mating
	Ewe: ram ratio	25-30:1	June
	Replacement rams	Weaning weight index of >110	June
Selecting of ewes	During lactation	Must have milk for three months	May to August
	After weaning	25% that grew the fastest and have no physical defects	August
	Fertility	Second time not conceived	After lambing season
	Weaning weight	42-45kg when weaned	After lambing season
Selection of lambs	Growth rate	300g/day	2-5 months
Nutrition	Fodder-flow planning	3% of body weight Dry material available	August
	Planting of pastures	100ha pastures – yield 6 tons dry matter per hectare	September to March
	Purchasing programme of supplementary nutrition	• Winter licks (108 days) 120g/SSU/day=62,8 tons • Summer licks (215 days)30g/SSU/day=31,3 tons • Ram licks 400g/ram/day, 6 weeks prior to mating season (96 rams) = 1,6 tons • Lactating licks – 200g/ewe/day, 6 weeks during lactation = 25,2 tons	Continuous

Health programme	Dosage	According to health programme	Feb., April,July,Sept.,Dec.
	Dipping		May
	Inoculation		Dec.,July,Aug.
	Foot-dip		March, April, June, Aug.
Protection against cold spells	Build shelter in the camp where the ewes will lamb	Large enough to give protection to 3000 ewes and 4050 lambs	March
Short-term objectives - Maize			
Average yield target	4 tons per ha		
Marketing strategy	R1350/ton		
WHAT	**ACTION**	**BUDGETED STANDARDS**	**WHEN**
Increase yield	Identify management zones	Vary inputs according to potential-low,medium,high and very high	August
Reduce production risk	Precision agriculture	Adopt variable rate technologies	September
	El Niño predictions	Avoid pollination during expected dry period	1st week of October
New Marketing strategy	Drawing up scenarios	Three-case scenario	September
	Sign contracts	At least 20% higher than total production cost per ton	October, January and June
	Average price	R1 350/ton	

PRODUCTION SYSTEMS IN AN AGRI-BUSINESS ENVIRONMENT

DEFINITIONS

Production systems involve the use of a variety of production practices that are employed to produce a crop of the highest possible standard in terms of quantity, quality and size, in order to achieve production objectives. Coordinating the production systems requires effective production management.

Production practices are the actions and processes carried out to achieve production objectives, such as fertilization, irrigation, pest and disease control, pruning and harvest.

Production objectives are measured in term of yield (how much), export percentage, fruit size and external and internal quality.

Production management is the management of production systems and production practices.

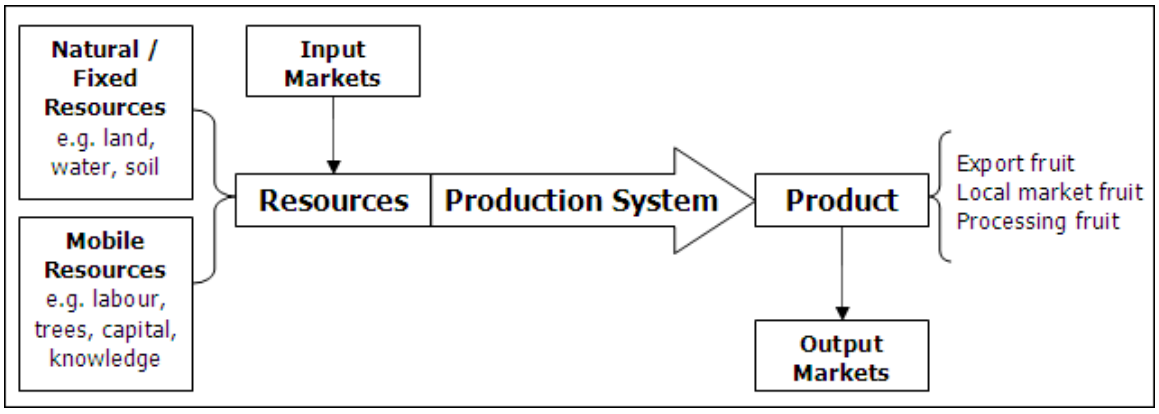


Figure 1.1: Production Conversion demonstrates the conversion process involved in, as an example, citrus production, where resources (inputs) are converted by a production system to a product, being citrus fruit (output).

Knowing the output market is essential. The requirements of consumers, wholesalers and retailers (market demand) determine many of the decisions that are taken in respect of production practices. Getting the highest possible return for the product that is produced will ultimately determine the commercial success of the farming operation.

Example:

In South Africa, about 60% of commercially grown citrus is exported as fresh fruit. Of the balance, about 25% is sold on the local market and 15% is sent for processing at juice factories. Yet over 90% of total revenue is generated from exports. For this reason, production practices are geared toward maximising the export pack-out percentage by ensuring that the requirements of foreign consumers are met.

A production manager (farmer) must stay on top of all the latest developments on the international market. This information drives the decisions made regarding all aspects of production, from cultivar selection, to the selection of chemicals, to the timing of the harvest. All these decisions are strongly influenced by market demand.

Increasingly, the higher paying markets are insisting that producers demonstrate their knowledge of and compliance with environmental regulations. These regulations are in some cases legally enforceable and in other cases set as entry requirements to output markets.

Good agricultural practices (GAP) regulations aim at meeting consumers' needs for products that are of high quality, that are safe to eat, and that are produced in an environmentally and socially responsible way. Producers who apply GAP would minimise the use of chemicals to prevent harming the natural environment. This process is commonly known in the industry as Integrated Crop Management.

NATURAL RESOURCE LIMITATIONS

Resources include those inputs that are fixed in relation to a particular site, such as land and water. These are known as natural resources, while mobile resources include labour, capital, planting material and knowledge. (See figure 1. above). We can always source more/additional mobile resources, but not fixed resources.

Natural resources are, by Definition, limited. More land or more water cannot be produced, and available natural resources must therefore be treated with respect if the farming operation is to be successful. The availability of these resources to meet the long-term needs of the enterprise is of critical importance.

The potential of a certain site for production depends on its climatic suitability for the varieties to be grown and the status of the fixed or natural resources, specifically the availability of sufficient high-quality water and suitable soil.

All resources come at a cost and the scarcer the resource, the higher the cost. Land and water are scarce, expensive, and have to be used efficiently.

Only about 13% of South Africa's surface area can be used for crop production, which is referred to as arable land. Only 22% of this area is considered to be high-potential arable land. Suitable land is the primary fixed resource and without it, nothing can be produced.

Issues to consider when deciding whether or not land is suitable for the production of a specific crop include:

- Is the land of sufficient size to support the required plantings?
- Is the land located in the right climatic area to support the desired varieties?
- Is the land free from certain pests and diseases?
- Does the land have sufficient areas of the required soil type and quality?
- Does the land have a sufficient supply of high quality water (as required by the crop)?
- Is the land located close to sources of skilled and unskilled labour?
- Is the land situated at an appropriate and manageable distance from packing and transport facilities?

THE INTERACTION BETWEEN AGRICULTURAL PROCESSES AND ENVIRONMENTAL FACTORS

It is not possible to produce a crop to meet market specifications without applying certain practices or interventions. This is because the planting of large areas to a single crop upsets the natural balance in the first place. The farmer finds himself in competition with nature. A source of food which did not exist before is created for various pests and diseases. In addition to this, different crops have to be manipulated in various ways to bear high yields of uniformly sized harvest entities of the desired quality.

The challenge facing the production manager is therefore to:

- Achieve yield targets;
- Ensure the products meet market quality specifications in such a way that the process is sustainable and within the framework of Good Agricultural Practices (GAP)

Environmentally speaking therefore, production must be managed in such a way that the processes can be used repeatedly throughout the lifespan of the production area (field, orchard) and beyond. This is achieved by minimising the use of harmful production practices and applying those that have minimum negative impact on the environment.

Examples of such production practices include:

- Selecting varieties best suited to the environment and climate;
- Using certified nursery material (in the case of trees and seedlings);
- Using pesticides with minimum impact on non-target insects;
- Minimising the use of soil tillage equipment; and
- Accurate and targeted use of fertilisers

Production practices are costly and some, especially broad-spectrum pest and disease control treatments, inorganic fertilisers and herbicides, can contaminate soil and run-off water. This causes pollution and reduces beneficial insect populations.

Production practices should therefore be carefully managed to achieve the desired production objectives with minimal harmful effects to the environment.

CASE STUDY

Bitter Sweet

*Sugarbirds pay the price of perfection **

By Jennifer Freeman, Africa Birds and Birding

Annually, the fresh cut-flower protea export trade is worth some R62-million to South Africa. Protea farming is viewed as an eco-friendly and sustainable method of farming, but it appears that

one of southern Africa's endemic bird families, the sugarbirds, could be paying a high price for its dependence on proteas. **Jennifer Freeman** reports.

Our farm in the Western Cape includes a section of mountain ground that is potentially suitable for protea production. Having already experienced problems with bird and insect damage to our export fruit crops, we were concerned about facing similar problems with cut-flower farming. The presence of Cape Sugarbirds on our property is unmistakable, as is that of baboons, antelope, small mammals, rodents and a wide variety of insects.

The Fynbos Research Unit at Elsenburg College, outside Paarl, advised us that, along with many environmental elements, birds are a very real factor in protea farming. I then contacted a recommended industry consultant and was more than taken aback when I was advised to use poison to control the birds.

The advice given was to sprinkle a solution of a pesticide, with the active ingredient monocrotophos, onto second-grade protea flowers and attach these to a few bushes in the orchard. I must, however, 'keep it quiet' and be sure to bury the doctored flowers and dead birds afterwards. Monocrotophos is an organophosphate poison with mutagenic effects. Although developed as an insecticide, it is highly toxic to birds.

In effect, cut-flower producers are at liberty to use poison indiscriminately in order to 'sterilise' the growing area. Poison has been and still is used for the control of birds in fruit crops, but it is viewed as completely unacceptable.

Before going ahead with any development on our farm I visited and spoke to many farmers and industry officials in a bid to discover the extent to which bird poisoning is practised within the protea industry, and whether or not the environmentally friendly programme for fruit could also apply to the cut-flower industry. Although many farmers were emphatically anti-poisoning, most of my enquiries were met with suspicion and brought me no closer to establishing what proportion of producers use poison to control birds. Growers were, however, happy to discuss control measures for other 'pests', ranging from baboons to insects.

Although producers are encouraged to grow formally planted protea orchards, flowers and 'greens' are still harvested from the veld. Protea growing may seem relatively trouble-free, but most farmers struggle against a host of potential setbacks; the strong winds typical of the fynbos region, the large numbers of insects present in protea veld and the scourge of *Phytophthora* (a fungus often present in soil water) all combine to increase investment risk.

Export flowers are subject to inspection by the Perishable Products Export Control Board (PPECB) and for this purpose the protea flower is divided into three sections: the top third, the middle section and the lower third (which includes the stem and leaves). Should any of these sections bear significant 'injuries', the flower will be rejected. Misshapen leaves qualify for rejection, as does a stem which deviates more than 50 millimetres in any direction along its length. 'Injuries' may include rub marks from wind, insect-chewed leaves – or scratch marks from sugarbirds. These scratch marks, which resemble fine brown hairs, are always located on the upper third of the flower. In effect, this means that there is a good chance that any protea bud or flower on which a sugarbird has perched will be considered unsuitable for export.

The sugarbird family, Promeropidae, is represented by only two species, both endemic to southern Africa. The Cape Sugarbird *Promerops caffer* is restricted to the fynbos biome, and Gurney's Sugarbird *P. gurneyi* to the eastern escarpment of southern Africa. Both have long brush-tipped tongues and extremely sharp claws which enable them to feed on a variety of nectar-producing plants in even the most inclement weather.

In autumn, when the grey-green protea scrublands of South Africa's fynbos region break into a sumptuous show of pink blooms, the breeding season of the Cape Sugarbird begins. The flowering proteas attract the sugarbirds by offering both a rich supply of nectar and a profusion of nutritious insects. The birds defend breeding territories, but forage communally at rich food sources such as flowering proteas. They form lifelong pair-bonds, raising two broods per year if conditions permit. Juveniles join the throng of other sugarbirds feeding in the nearest protea thickets. A single sugarbird can visit and potentially pollinate as many as 300 protea flowers in one day. The birds probe bowl-shaped proteas, such as the king protea *Protea cynaroides*, as well as chalice-shaped and cup-shaped proteas, *P. neriifolia* and *P. nitida* respectively. They do also feed from pincushion proteas, but do not damage the flowers significantly because the bracts are too narrow to be pierced or scratched by the birds' claws. Various *Aloe* species, red-hot pokers *Kniphofia*, Cape honeysuckle *Tecomaria capensis*, several *Watsonia* species, and the Australian bottle-brush have also been recorded as food sources. Sugarbirds eat insects as well as nectar, and mostly feed insects to their chicks.

As spring approaches, protea blooms become scarcer and the birds move off to new feeding grounds on higher slopes or in gardens. Cultivated proteas flower extensively in summer, becoming an ideal and irresistible food source for the birds in the months before the breeding season.

Deliberate poisoning of sugarbirds at this time could have severe repercussions, not only due to the deaths but also to the breaking of pair-bonds.

It is difficult to determine whether or not sugarbird populations are currently decreasing or have done so in the past. We know that neither Cape nor Gurney's Sugarbird is classified as threatened in any way (*The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland*), but further than that, no population statistics are available.

One PPECB inspector, who had 15 years' experience in the Eastern Cape, claimed that growers had 'raped' the fynbos environment by using poison and by encouraging children to kill the birds for pocket money.

The Elsenburg Fynbos Research Unit informed me that organic production of proteas is unrealistic because of the high number of pests in the cut-flower environment, but they did encourage farmers to use environmentally friendly pest controls. The removal of dead flowers, for example, is recommended to prevent possible rodent or ant damage to export-quality blooms. It is not clear, however, how often such advice is put into practice.

It is easy to lay the blame at the feet of the farmers but, as participants in the business cycle, consumers are equally responsible: farmers will supply according to buyer demand. My aim is to highlight the potential for flower buyers to create a demand for 'sugarbird-' or 'fynbos-friendly' proteas. But I also hope that the South African protea industry will take the initiative to promote its valuable product as being authentic, unique and responsibly produced, instead of waiting for consumers to force them to do so.

OPTIMUM USE OF RESOURCES FOR OPTIMUM OUTPUTS

Natural and mobile resources should be deployed in an effective manner. This means avoiding wastage, duplication and incorrect resource application and timing. For example, water, which is a scarce resource, should be applied at the right times and in the right amounts. To achieve this may require that other resources, such as soil, be properly selected and prepared and that the labour (another important resource) used to apply the water be adequately trained.

Resources can also be under-used. For example, the establishment of a new a production area (field/orchard/animal husbandry area) requires adequate capital to be available for the purchase of high-quality inputs (nursery materials/trees/animal breeding stock/irrigation system/required equipment). Capital is a resource which, if not available in a sufficient amount, can lead to an under-capitalised venture and likely failure.

In addition to the effective use of resources, appropriate systems, processes and procedures that enable the achievement of the highest income at the lowest cost, must be put in place. The highest income is achieved when resources are cost-effectively applied to optimise production and, in so doing, also enable the greatest possible proportion of yield to meet the demands and requirements of the best paying markets (either local or export).

THE PRODUCTION PLAN

The Production Plan encompasses all the details surrounding how your farm operation will produce products for market. It includes such things as land, buildings, equipment, supplies and processes, as well as laws and regulations that impact the business. Production is the core income producer for a farm, so this section deserves detailed attention.

- Land, Buildings and Facilities - Description of land and buildings used by the farm operation
- Equipment - Description of equipment, vehicles, machinery used in the farm operation
- Materials and Supplies - Description of materials and supplies used in farm production
- Production Strategies - Production procedures. What to produce, when to produce it, when to market it.
- Construction/Production Schedules - Schedule of production and schedule for construction of new facilities

- Environmental Assessment Plan - Soil conservation, water quality control, manure management, etc.

- Political and Legal Aspects of Production - Zoning, environmental policies, regulations and laws which effect production. Quality control and inspection requirements

Land, Buildings and Facilities

In this section you will include a detailed description of the land and all of the buildings used by the farm operation. This needs to be specific. For instance, rather than listing "barn" you should include the size of the structure and what activities will take place inside of it. Include things such as fencing in this description. The idea is to have a complete and detailed description of the physical facilities available. If there is an intent to lease land, that too should be included here.

Equipment

Here you will include each piece of farm related equipment. Tractors, implements, trucks and other vehicles that will be used as part of the farm operation are obvious things to list. Don't forget things like computers, printers, office equipment, etc. Also remember to list other equipment that will be used that might include hand tools, shop equipment, irrigation equipment and such.

Your buildings, facilities and equipment are generally depreciable assets. Having them listed in a business plan can be helpful come tax time.

Materials and Supplies

Include all materials and supplies necessary for the operation of the farm. Feeds and hay are obvious examples. Less obvious are fertilizers, soil amendments, gasoline and oil and other consumables, as well as materials that will be necessary for maintenance and repair. It is important to capture as many foreseeable expenses as possible in this section.

Production Strategies

It is important to not only identify what you are producing, but how you are going to produce it. Include projected schedules. Will you have spring or fall births? When and how will your produce be sent to market? How will your production expand over time? When will you know that you have achieved optimum size and production?

Construction/Production Schedules

By now you should have a vision of your farm's annual operations, as well as an idea of what it will look like over the long term. In this section include both. For instance, for a livestock operation, you will need to plan for breeding season and birthing season. You will need to plan for routine husbandry (shearing, worming, vaccinations, foot care, etc.). Experience has shown that it is helpful to have these things scheduled.

For the longer term, it is important to have an idea of when that new shelter will need to be built, the new paddock fenced, the pasture seeded, etc. Having a plan for these things will assist in controlling costs and budgeting.

Environmental Assessment Plan

In many areas of the country there is a growing emphasis on good stewardship of the environment. It is wise to have a plan in place for this. How will you manage manure? What steps will need to be taken to assure water quality, including run-off from pastures, stream protection, etc.? If erosion on your land could be a concern, what steps will need to be taken to control that?

Many areas will have access to Government Agencies (e.g. Soil and Water Conservation Districts) that can provide information to help with developing this part of the plan.

Political and Legal Aspects of Production

There have been many stories of people that have acquired what they thought was the perfect piece of land, only to discover later that local ordinances restricted the use they could put it to. To avoid that, these issues need to be explored before investments are made.

In this section, include an examination of any laws that could impact your production. These might include, depending on region, anything from stocking rates per acre to stream enhancement policies to irrigation rights.

Example of production plan

Land buildings and facilities expansion

1.	Location:	Abbotsford		
2.	Description:	Broiler Chicken Farm		
3.	Size:	10 acres		
4.	Current operations:	Birds per cycle	20 000 birds	
		Housing requirement	0.75 sq. Feet per bird	
		One double storey barn	40 ft x 210 ft (includes space for storage)	
5.	Expansion plan:	**1995**	**1996**	**1998**
	Birds per cycle	5,000	5,000	10,000
	New double storey barn (40 ft. x 100 ft.)	R60,000		
	Double storey addition (40 ft. x 100 ft.)			R60,000
	50% equipment installation	35,000		
	50% equipment installation			35,000
	Generator upgrade (75 KVA)	10,000		
	Quota acquisitions	100,000	100,000	100,000
	Total Costs	**R205,000**	**R100,000**	**R195,000**
6.	Land:	R 350 000.00		

Cost of facilities, 1994

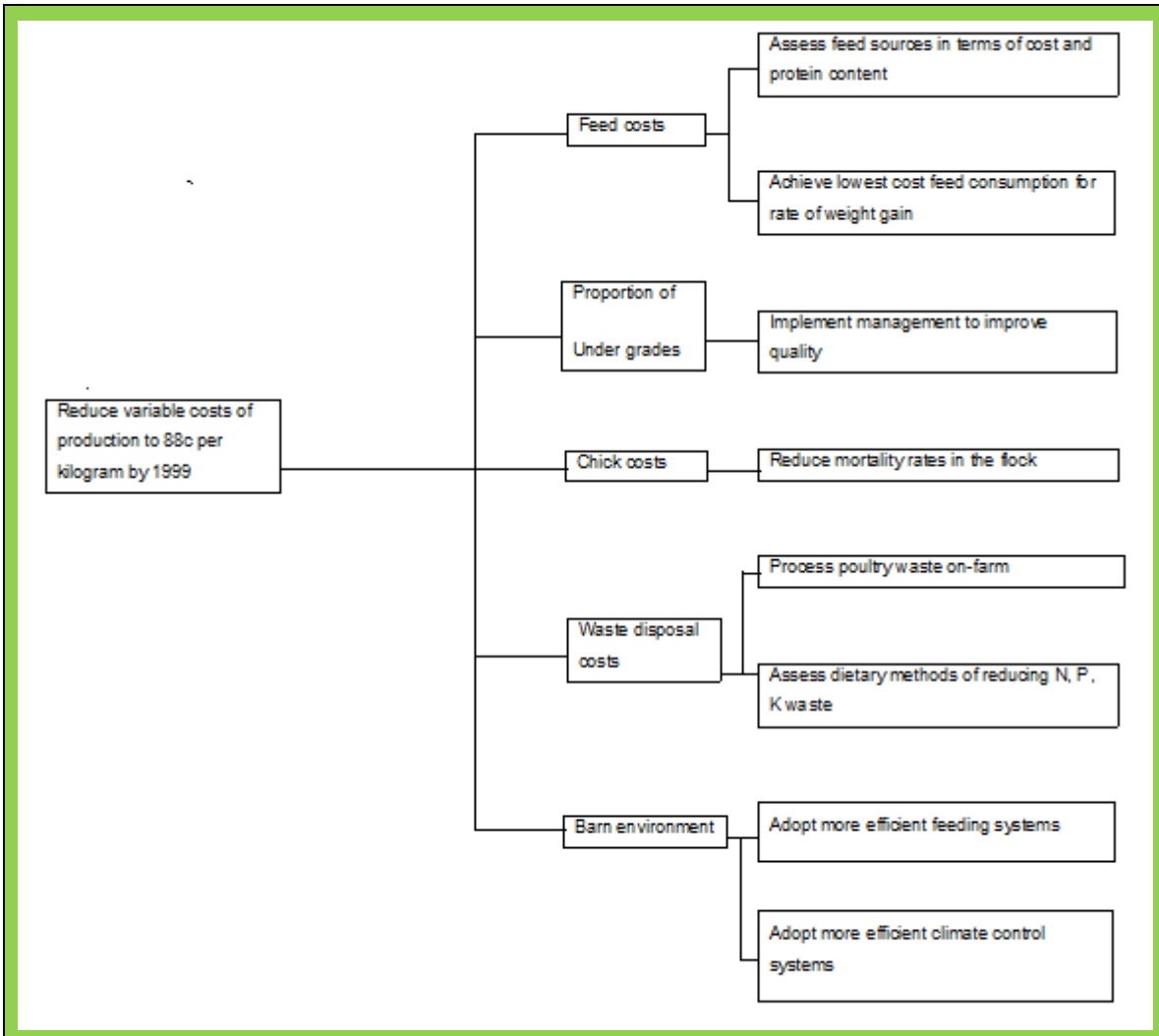
EQUIPMENT	NEW COST	REMAINING UNDEPRECIATED VALUE	UNDEPRECIATED VALUE PER LIVE KILOGRAM	ANNUAL DEPRECIATION PER LIVE KILOGRAM
Poultry barn	R 100 000	R 85 006	R 0.327	R 0.013
Barn equipment	R 60 000	R 25 190	R 0.097	R 0.019
Backup generator	R 15 000	R 4 915	R 0.019	R 0.004
Incinerator	R 2 000	R 655	R 0.003	R 0.0005

Manure shed	R 18 000	R 16 589	R 0.064	R 0.0025
Clean-out tractor	R 12 000	R 2 017	R 0.008	R 0.0023
Quota	R 75 000	R 57 274	R 0.220	R 0.0116
TOTALS	R 282 000	R 191 646	R 0. 737	R 0. 0532

Materials, supplies and services, 1994

DESCRIPTION	1994 REQUIREMENT PER CYCLE	TOTAL COST	SUPPLIER	ORDER LEAD TIME
Chicks	20000	R10 192	Local hatchery	4 weeks
Feed	74 tonners over 42 days	R 20 160	Local feed company	1 week
Medication/ vaccinations	Coordinate with chick placement	R 900	Local veterinarian	As required
Chicken catching	Date required	R 740	Contract catcher	1 week
Waste removal	Date required	R 360	Contract handler	1 week
Processor	Delivery date		Local processor	2 weeks

Example: Production strategies



Construction schedule

WEEK	1	2	3	4	5	6	7	8	9	10	11	12
Select design	x											
Select site	x											
Blueprints		x										
Order components			x									
Land clearing				x	x	x						

Prepare base						x	x	x				
Pour foundation								x				
Building assembly									x	x	x	
Install equipment/utilities											x	x
Site clean up												x

Quota acquisition and production expansion schedule

YEAR	Birds per cycle				PROJECTED NUMBER OF PRODUCTION CYCLES PER YEAR
	QUOTA PURCHASE SCHEDILE	GIFT QUOTA	CUMULATIVE QUOTA	CUMULATIVE BARN CAPASITY	
Prior years	5 000	10 000	15 000		
1994		5 000	20 000	20 000	6.5
1995	5 000		25 000	25 000	6.5
1996	5 000		30 000	30 000	6.5
1997			30 000		6.5
1998	5 000	5 000	40 000	40 000	7.4
1999			40 000	40 000	7.4

MANAGERIAL TASKS OF PRODUCTION MANAGER

Successful agricultural production management depends on the effective application of standard management principles and practices. It is similar to managing any other complex project – similar steps are followed. These steps are as follows:

- Define, understand and clearly state the overall goal or objective of the operation or project, for example define the standards to which the end product has to comply;
- List the actions needed to achieve the end result (*what has to be done)*
- Naming the individuals who are responsible for the work *(by whom)*
- The deadline dates by when the various tasks have to be completed *(by when);*
- Define ways of evaluating and measuring progress and use results of this constant review process to influence future planning and operations *(how will we know it is done/what will we do differently next time).*

PLANNING

Definition:

Planning is to formulate a scheme, a programme or method, to accomplish a specific goal within a specific timeframe, and with a specific purpose in mind.

If goals are long-term, meaning that it will take more than a few years to achieve, or strategic, meaning that they apply to the farming operation as a whole, the planning involved in achieving these objectives will likewise be long-term and strategic in nature. If, on the other hand, goals are short-term, such as applying fertilisation before a certain date, a short-term operational plan or action plan is required.

Planning is concerned with thinking through, and when necessary, listing, the steps and actions required to progress from the present situation to a desired situation. These steps are planned in chronological order, together with whatever resources are required to complete each step.

We plan our every-day activities automatically, such as getting up and dressed in the morning. However, when it comes to more complex actions or tasks we have to put more effort and care into planning. For example, fixing a roof leak requires as a first step, a plan. This plan will include:

Fixing a leaking roof		
What?	Define the problem	The wind blew some of

		the tiles off the roof and the south-eastern corner now leaks.
What?	Has to be done to address the problem	Tiles have to be replaced, plus insulation sheeting replaced.
How?	The problem should be addressed	
By whom?	Who is doing to do the work?	Contractor: Mr Fixit (cheapest of 3 quotes/preferred supplier)
What?	Tools and materials needed	Tiles, sheeting, ladder
Where?	The tools and materials will be acquired	Builders' Warehouse (cheapest of three quotes)
How much?	The cost of tools, materials and labour	R1200
By when?	When it should be completed?	31 August 2005

Without planning there would be no step-by-step sequence of actions taking us from where we are to where we want to go. Our actions would be random, and we would waste time, energy and money in repeating certain steps and leaving out others, while compromising our chances of reaching our goal. In the process, we could do things that threaten the future of the business and harm the environment.

SCHEDULING

Definition:

Scheduling the management term that involves entering or drawing up a timetable for the completion of various stages of a complex project, or the coordination of multiple related

actions or tasks into a single time sequence. Scheduling is most commonly used with regard to repetitive tasks, such as the application of irrigation.

A schedule indicates the intervals between, or frequency of, actions. For example, a class timetable shows when different subject lessons will be taught and the intervals between similar lessons. In the same way, a bus roster shows the regular arrival and departure times of buses. These are different kinds of schedules.

Scheduling is important because it provides the manager and her/his staff with a fixed programme for carrying out required actions or tasks. Once a schedule to an action has been set and communicated, the expectation is that it will be strictly kept to.

ORGANISING

Definition:

Organizing means to arrange tasks in an orderly functional, structured, coherent and systematic manner to bring about harmonious or united action.

Proper organisation means that different resources for a specific task are available when and how they are required.

For example, consider the planting of a new citrus orchard. The production manager has to ensure that all the necessary resources for this operation are available in the situation and at the time they are needed. Part of the labour force would be allocated to preparing the orchard lay-out, while another would install the irrigation system, and a third group would be unloading the nursery trees from the truck. In all cases, the manager has to ensure that the labour force has the right equipment to carry out their tasks effectively. At the same time, the manager has to ensure that he has allocated his capital effectively between the different parts of the planting program.

Clearly, effective organisation has to be preceded by good planning.

IMPLEMENTATION

Definition:

Implementation is the act of carrying out the agreed plan according to an agreed schedule to achieve what has been agreed should be done.

A plan cannot be effectively implemented unless the necessary resources are available. It is equally important that the required infrastructure be in place. Infrastructure is a term that refers to permanent non-consumable items required to support the implementation process. This includes roads, rail and air links, equipment, tools, vehicles, fuel supply depots, vehicle maintenance facilities, chemical supply points, offices, storage rooms, pump houses, packhouses, etc. The production manager ensures that the necessary infrastructure is in place and makes the appropriate contingency arrangements when such facilities are not yet available.

As circumstances and conditions change, the implementation process has to be constantly measured, evaluated, reviewed and adapted.

COORDINATION

Most tasks and almost all projects involve the activities of more than one person. Production management is, by Definition, a process; the various aspects of which are carried out by different individuals with different skills.

We have already dealt with the concept of ***organising***, which is about the allocation of resources. Coordination is about bringing in the various players at the appropriate times and in the most effective way in pursuit of the agreed objective. Most projects and tasks require some form of coordination. Without it, aspects of the work could be unnecessarily repeated, and others lost.

Coordination is an important aspect of the agricultural production manager's job. In fact, virtually all that gets done by the staff in the production process is the result of the coordination of different tasks or inputs. For example, the application of a pest control spray requires that the production manager coordinates with the administration personnel to ensure that the chemicals are ordered and delivered in time, the maintenance department to ensure that the tractors and spray equipment are in good working order, and the labour force to ensure that enough workers are available to complete the task.

MONITORING

It is not enough to plan, organise, and implement a program. The process can only operate successfully when the feedback cycle is also operating. The feedback cycle involves:

- Control
- Feedback
- Adaptation
- Correction

The feedback cycle is a continuous process of measuring progress and evaluating it against the original objective(s). It is about asking:

- "Are we still on track?"
- "Are my original assumptions still valid?"
- "Do I need to adjust my goals, timeframes or implementation process in some or other way?"

The feedback cycle must be formalised and be part of the procedure for executing tasks. It may involve the use of short interval control measures. A short interval control measure is a progress check on a regular short interval basis, such as weekly or fortnightly.

One way of doing this is to break down the program into smaller short-term milestones and measure progress against these milestones on a scheduled basis. If any of the milestones are not met, a decision has to be taken on whether the implementation of the plan needs to be changed or whether the original plan needs to be adapted or corrected. The effectiveness of a pest control program can for example be monitored by carrying out frequent and systematic inspections of pest populations. Based on these results the programme can be adjusted to ensure that the original objective is met.

Figure 1.2 illustrates the management process chain, incorporating all the stages through to feedback and correction.

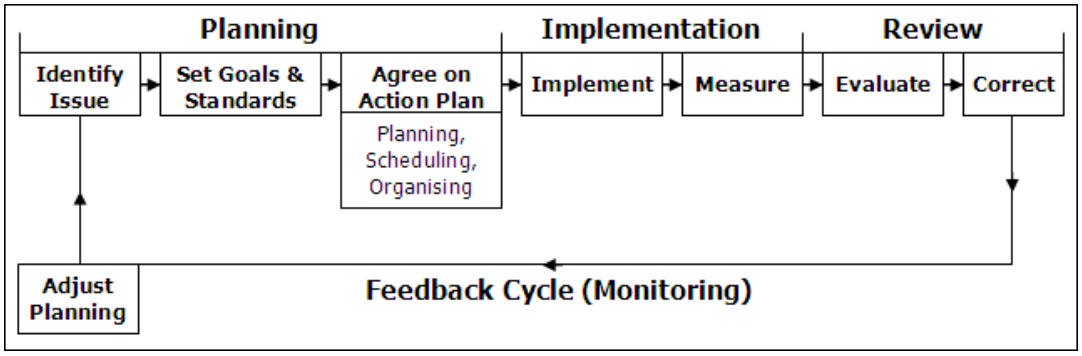


Figure 1.2: Management Process Chain

DECISION-MAKING

Definition:

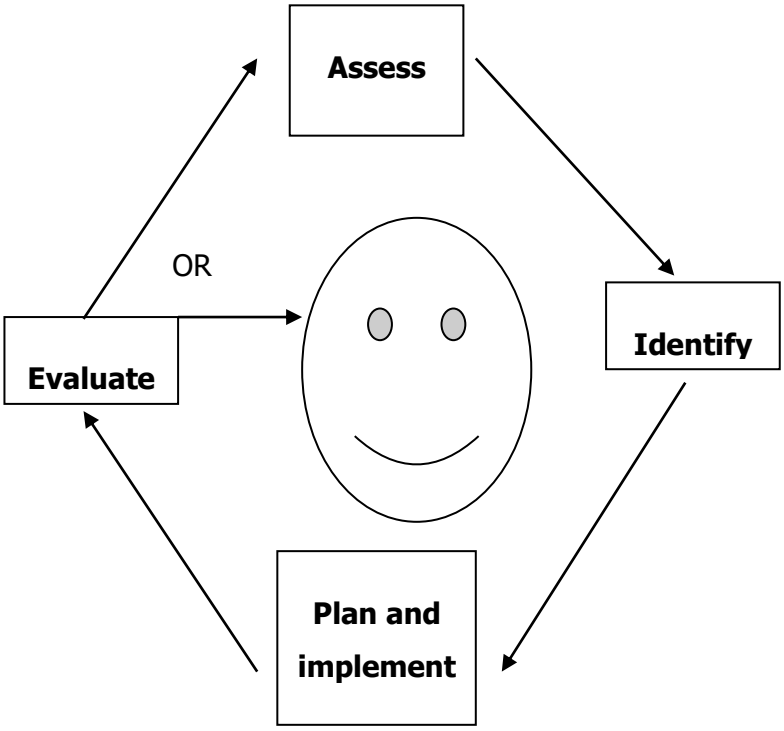
Decision-making is the cognitive process of selecting a course of action from among multiple alternatives. Common examples include shopping, deciding what to eat, etc

We all make decisions every day, both at home and at work. We make many decisions without much effort, and without concerning ourselves unnecessarily with what their impact will be. For example, we make decisions about what to wear, when to perform a task, what to eat, when to eat, and many other small, seemingly insignificant issues. But even for the smallest decision there are consequences and risk. As the risk associated with a decision increases, so the decision becomes more important.

In agricultural production, as in any other business, the level of decision-making is tied to the nature and level of the job. For example, the office cleaner has his tasks clearly and precisely described and performs his tasks according to this description without making very many decisions on her/his own. At the other end of the scale, the production manager is faced with many different situations, some requiring decision-making that carries long-term and serious consequences for production, and thus for the company. The production manager has to use her/his discretion more often and with greater consequence than the cleaner.

Decision-making is part of every facet of every business. Decisions are required when goals are set and when actions have to be taken to enable those goals to be met.

The Decision-Making Process



Step 1: Assessment	Step 3: Plan and Implementation Solution
• Become aware of the problem • Gather information about the problem • Identify the real problem / root cause • Formulate the problem and alternative statements • Look for the obvious	• Plan for implantation • Identify potential barriers • Identify potential consequences • Implement solution • Monitor to determine effectiveness and what should be changed or corrected
Step 2: Find Solutions	**Step 4: Evaluate Outcome**
• Identify alternative solutions • Gather information about solutions • Choose the most effective solution	• Has the problem been solved? • Has the goal been reached? • You learn from experience – both from mistakes and successes

LEADERSHIP

In order to manage, and therefore to deal with management issues such as planning and budgeting, organising, implementing, controlling and problem solving, it is important for manager so demonstrate good leadership qualities.

Leadership requires a range of abilities and characteristics and there are many good leaders with very different personality types. However, four key ingredients tend to be common in most successful leaders. These are their ability to:

- Give direction;
- Align people;
- Motivate and inspire people; and
- Introduce change

Good managers need to have leadership qualities in order to:

- Develop a vision of the future;
- Influence the creation of teams that understand the vision and goals;
- Energise people by understanding and satisfying their human needs; and
- Introduce new, more effective ways of doing things

Good leaders are usually emotionally mature, resilient, flexible and adaptable, persistent, results driven, energetic and decisive. They demonstrate the ability to take initiative, have a full grasp of the situations for which they are responsible, express their convictions and stimulate others to do the same, and encourage evaluation and feedback.

COMMUNICATION

INTRODUCTION

This is frequently identified as the most important factor underlying the ability of a group of people to work together productively. People gain perceptions of a task, an individual and an organisation through the things they hear, see and read. For the agricultural production manager to improve performance, s/he must be ensuring that the team knows:

- What to do;
- Why they are doing it;
- How to do it;
- How well to do it; and
- How well they are doing it.

Good communication is vital if the objectives and goals are to be clearly understood and effectively met.

COMMUNICATION PLANNING

INTRODUCTION

Communication and in particular written communication for a specific context is always improved if the message is well planned and organised. The communicator (in both the case of written or verbal communication) needs to consider four main areas in planning the communication message:

- The reason for the message
- Who the audience will be
- What message/information needs to be disseminated
- How best to transmit the message?

ANALYSING THE AUDIENCE

Before any communication takes place, the communicator or sender of the communication message must analyze his audience and identify with whom he wants to communicate.

The more effectively the audience of a message or communication is understood, the more effective communication will be. The recipients or audience of verbal or written communication will therefore affect decisions about kind of language to use, the channel likely to be the most effective, and the possible obstacles to ensuring that the message is clear. The context of the communication that is required will also affect the planning of communication. In this module we define the context as the workplace.

ASSESSING AND ADDRESSING YOUR AUDIENCE

Choosing the right vocabulary

The words you use to convey your message should suit the purpose and the audience. Here are some tips to help you choose the right words:

- Avoid technical terms

  If you have to use them (because your audience is technical or expert), define them in a glossary (if the message is written) or define them at the beginning of your speech (if the message is verbal).

- Choose familiar words

  Words that are often used – the shorter the words, the better.

  For example, rather use the word "ask" than "request" and "stop" rather than "terminate".

- Be as specific as possible

  For example, rather than talking about a "letter", you could say "a letter of thanks".

- Watch adjectives and adverbs

  How big is "huge"? How good is "excellent"? How much is "very"? Words such as these mean different things to different people – and you and your receiver may not agree on a Definition.

- Avoid words that pre-judge a situation

  "Why are you hanging around here?" has a negative connotation. The receiver is already given to understand he has done something wrong.

- Choose the right level of formality

  You will need to be much more formal in a report than if you are writing a short thank you note to a colleague.

CHOOSING THE RIGHT TONE AND STYLE

Tone

Tone describes the sender's attitude towards the receiver and the material being communicated.

Although it would seem that the word "tone" should only be applied to verbal messages, it is just as important in written messages.

In a spoken message it is conveyed by your voice, your body language and the words you use. In written messages tone is conveyed by the words you use. Most of your correspondence should have a friendly or neutral tone, rather than a stiff or unfriendly tone.

Tone relates to how a writer deals with his subject or his audience. In written business communication Business English, it is important to adopt a pleasant and often persuasive tone rather than an aggressive or demanding tone. Always put yourself in the shoes of the receiver and think how you would feel on receiving a threatening or aggressively worded piece of writing.

Compare

Receipt of your letter of the 15th instance is acknowledged. Please be advised that the queries are being checked by the undersigned, which will revert back to you in due course.

Thank you for your query received on 15 March. I am collecting the relevant information and I will contact you again as soon as possible to answer your questions.

Style

Style refers to a way of writing or speaking. It is the way a sender puts together words for a wide range of purposes and audiences.

Style can be defined in terms of how formal it is:

- Whether it is personal or impersonal
- Whether it is active or passive
- Whether it is concise or wordy
- Whether it is clear or ambiguous
- Whether it is concrete or abstract

WRITTEN COMMUNICATION IN THE FARMING ENVIRONMENT

Within the role of the production manager (farmer) it will be expected of you to communicate with various stakeholders in writing. The forms of written communication include:

✓ **The letter**

Letter writing is the most common form of written business communication. It is very important that you are able to structure a business letter correctly.

A single mistake on a business letter will spoil the entire letter. Not only must letters be error-free, but also the message must be clear and concise. Your competence is often measured by the quality of the letters that you write.

It is very important that the tone of your business letter is always polite and professional. In some cases, where you are complaining or criticising, the tone must be firm yet never aggressive. A business letter is often the only contact an organisation has with its' various stakeholders, i.e. its customers, suppliers, shareholders and so on.

A letter's presentation and the information it contains will have a strong impact on the receiver. It is thus extremely important that letters are well planned, constructed and written.

You need to start by knowing why you are writing the letter – to persuade, to give facts, to ask for information or even to generate goodwill. It is essential that you know the purpose of the letter before you even start writing.

It is also essential that you analyse your audience, in order to understand their needs – for support, for information and so on. If a letter is to achieve its objectives it must be written

clearly and in a language the reader can easily understand. We have already discussed style and tone in a previous section, and whatever was discussed then, applies to this section.

Here are some tips to make your letters more readable:

- Have a clear subject line
- Begin by summarising the situation
- Use headings, even if the letter is quite short
- Use simple words, short sentences and short paragraphs
- Summarise the key points at the end of the letter
- Call for the action required in the final paragraph

Letters today are written in block format. This makes them easy to compile when you are using a word processing package on a computer or are writing electronic messages, which is communicated via e-mail.

Each paragraph begins at the left-hand margin, a line is skipped between paragraphs, and the left and right-hand margins can be set up to fit in with the company letterhead style.

Here is an example of a formal letter:

ADDRESS OF SENDER:	The ABC Electrical Suppliers
	P O Box 1234
	JOHANNESBURG
	2000
	Telephone +27311 1234567
	Fax +27311 12345678
	E-Mail abc@iafrica.com
REFERENCE:	Ref: ISL/21/eb
DATE:	28 February 201_____

RECEIVER'S ADDRESS:	Mr A Person
	Sales Manager
	ABC Electrical Suppliers
	P O Box 1234
	JOHANNESBURG
	2000
SALUTATION:	Dear Mr Person
SUBJECT HEADING:	ORDER OF OFFICE STATIONERY
INTRO PARAGRAPH:	Thank you for your letter of …
CONCLUDING PARAGRAPH:	We look forward to receiving …
COMPLIMENTARY CLOSE:	Yours sincerely
	(Signature)
TYPED NAME:	A COUSINS (Title if necessary)
POSITION:	ACCOUNTANT
ENCLOSURES:	Encl.
INITIALS OF SENDER & TYPIST:	AC/dc

- ✓ **Reports**

A report is a formal detailed account which is written when someone has been instructed to investigate and report on a certain problem or matter of investigation.

It contains the results of the investigation and very often recommendations as to the action that should be taken next. A report is generally written for a wide variety of readers, and the report writer should therefore assume a mixed audience, unless he has specific information to the contrary.

✓ **Meeting communication**

Meetings are a formal group activity, when a number of people gather together to achieve a specific objective. Groups can vary in size from a few people to a few hundred people. It is normal to have some members who have a designated office or role, such as chairman, secretary and treasurer.

Every meeting should have a purpose and one must avoid the situation where organisational meetings continue to be held out of habit, long after they have ceased to have any relevance. It is the function of the **notice of the meeting** to set out the reasons for calling the meeting, as well as other details such as the date, time, venue and who should attend.

- Notice of a meeting

The members of a committee must be informed of the date and agenda of the next meeting. The agenda contains a summary of points that will be discussed at that meeting. This is given in advance so that the participants can prepare for the proposed discussions. A notice and agenda of the next meeting is set out as follows:

NOTICE OF MEETING

The next monthly meeting of all Department Managers will be held on 8 March 201___ at 15.30 in the Training Room.

AGENDA

1. Welcome
2. Apologies
3. Minutes of the last meeting
4. Matters arising
5. Correspondence
6. Proposals to expand customer base
7. Financial Department report
8. Sales Department report
9. Service Department report
10. Stores and Purchasing report
11. Any other business or General
12. Date of the next meeting
13. Closure

L Kubheka
Secretary
Telephone number 476-9076

18 February 201____

Note:

1. Note that numbers 1 to 5 and 11 to 13 are **fixed items** that appear on EVERY agenda.

2. Numbers 6 to 10 is PARTICULAR ITEMS that vary depending on the nature of the particular meeting and type of club or business.

- Minutes of a meeting

  Once a meeting is gathered, the secretary (or some other appointed person) is responsible for taking the minutes. The secretary will record what was said and by whom. This will be typed out after the meeting and a copy of the minutes will be given to each participant. The minutes serve as a reminder of the discussion and are used to check that participants are carrying out the actions that they were given at the meeting.

  The layout of the minutes of a meeting is as follows:

  MINUTES OF THE STYLE CLOTHING DEPARTMENT MANAGERS MEETING HELD ON TUESDAY 9 FEBRUARY 201_____ AT 8.30 IN THE COMMITTEE ROOM

  Present: _____, _____, _____, _____

  1. Apologies

     No apologies were recorded.

  2. Welcome

  3. Minutes of the last meeting

     Minutes of the last meeting were read and signed by the Chairman as correct. (proposed _____ ; seconded _____)

  4. Matters arising

     A receptionist (Jane) and an assistant storeman (John) have been employed. The virus has been removed from the computer programme.

  5. Correspondence

6. Financial matters

Michelle, the accounts clerk, has captured all the financial data on the computer. The final accounts for the last quarter have been completed. She will now devote her time to credit collection. No cash flow problems are expected for the first half of this year.

7. Sales matters:

Sales are good and quarterly figures are up on last year. A new competitor, Design Clothing, has opened up less than one kilometre away. We must keep our sales service standards as high as possible. Perhaps the staff must be sent on a sales course.

8. General

Betsy, the tea lady, has been with the company for ten years next month. Some sort of award must be made.

9. Date of the next meeting

8 March 200____ at 15.30 in the Training Room.

10. Closure

The Chairman closed the meeting at 15.00

- ✓ **The Curriculum Vitae**

A CV tells a prospective employer about your personal details and what you have achieved during your lifetime. Your CV, together with the letter of application, will be used to sell yourself to a company, and must therefore contain all the facts employers need to know about you. It must look professional, and it must be easy to read.

The Labour Relations Act (November 1996) specifies that no prospective employer may ask questions of an applicant that could be regarded as being discriminatory.

This includes such aspects as age, race, marital status, number of children and religion. It would be naïve of us to imagine that employers do not want at least some of this information, simply because they are not allowed by law to ask for it. Your CV will not need to mention race or religion, but it should contain other personal details.

A good CV should at least contain the following sections.

- Personal details
- Academic record
- Membership to any professional bodies
- Work experience
- Career plans
- Awards / achievements
- Hobbies and interests
- Referees / References

MOTIVATION

Motivation is about helping people to be passionate about their work. The basis for good motivation is participative goal setting, where every person is given the opportunity to participate in setting goals. As Tony Manning, a strategy consultant says:

- People get turned on when they're counted in
- When you treat them like eagles, they soar
- What you get hinges largely on what you expect
- Most people can and will take on far more than we think, if only they're given a chance

According to Farmers' Weekly contributor Peter Hughes, motivation killers include professional managers who do things by the book but don't care about their people.

Incentives can enhance motivation, though it must be remembered that internal motivation lasts longer than external motivation which must be repeatedly reinforced by praise and concrete rewards. A feeling of belonging (affiliation) and approval are strong motivators.

DELEGATION

Delegation is the practice whereby the manager entrusts his authority to others. The aim of delegation is to get the job done by someone else, not just the simple tasks, but also decision-making based on incoming information. With delegation, personnel have the authority to react to situations without referring back to their manager. However, the manager still remains accountable for the satisfactory completion of the task.

Delegation is a style of management that allows staff to use and develop their skills and knowledge to their full potential.

To enable someone else to do the job, the manager must be sure that his personnel:

- Know what he wants
- Have the authority to do or achieve it
- Know how to do it

These all depend on a clear communication of the nature of the task, the extent of the discretion they can use, and the sources of information available to them.

Delegation does not mean that the manager should pass on his less pleasant tasks to his subordinates and keep the more pleasant tasks to himself. A good manager will distribute the mundane tasks as evenly as possible and the more exciting ones widely. Delegation also does not mean that the manager can hide behind her/his staff by giving full accountability to them for issues that s/he should be dealing with her/himself, which is referred to as abdication.

DISCIPLINE

Discipline is about doing what you are supposed to when you are supposed to and how you are supposed to do it. A production manager required to exercise discipline at all times. Discipline is what is required when a number of tasks have to be completed in a short period of time.

Discipline in the manner in which one approaches a task is essential, and this is based on disciplined thinking. If the objective have been set, the plan been agreed upon and all the other tasks been completed, it is the discipline of executing the task in the prescribed manner that will get the job done.

Disciplinary action is taken to deal with individuals who disobey company rules or whose performance is unsatisfactory in relation to agreed standards. Disciplinary action is an important

part of the manager's duties and positively reinforces the significance that the company and manager attach to the maintenance of standards and behaviour.

Some managers tend to avoid disciplining their subordinates for fear of becoming unpopular and losing their support. Other managers tend to use their disciplinary powers to enforce participation and performance. Neither of these extremes is good. Preferably the manager should strive to maintain consistency in dealing with disciplinary matters and be seen to be firm but fair.

CHAPTER 2

MARKETING IN AGRICULTURE

In this chapter we explore the following concepts:

- Market research
- The process of market research
- Resources required for market research
- Managing market research
- Marketing mix
- Marketing budgets
- Effective distribution of farm products
- Selection of distribution channels
- Transport modes
- Co-operative marketing and distribution

MARKET RESEARCH

INTRODUCTION

Far too few farmers and agricultural enterprises give detailed thought to exactly what they are trying to achieve through marketing. Clear marketing objectives are needed to aid operational decisions. Marketing objectives should be set with keeping the following in mind:

- Marketing objective should fit in with broader objectives of the farm.
- They should be realistic, taking into account internal resources and external opportunities, threats and constraints.
- Everyone in the company should be aware of the marketing objectives so that everyone can relate these to his or her own work.
- They need to be flexible, since many business decisions are made under conditions of partial ignorance.
- They should be reviewed and adapted from time to time to take changing conditions into account.

Efficient marketing is essential to the success of a farming enterprise. Producing the best quality produce is of no use if it does not meet the requirements of the market.

When considering the establishment of a farming enterprise, it is critical to ask the following questions:

- What can I produce that the market will want?
- Is there a market opportunity for the range of crops and cultivars that I can produce in the area of my farm?

Very simply, when considering whether to embark on a new agricultural enterprise or diversify to new crops on an existing farm, the very first step is to carry out **market research**. Market research may also be required for adapting existing production processes to be able to service a different, possibly more stable or more lucrative market.

Definition:

Market research is the process of gathering, analysing and interpreting information about a market, or about a product or service to be offered for sale in that market, and about the past, present and potential customers for the product or service.

The simple questions asked above are not that easy to answer and different people have different answers to those questions. On top of this, crops produced in South Africa are marketed in many countries around the globe and today's global agricultural trade environment is one of over-supply and extensive diversity of produce.

In South Africa, Growers' Associations have been established by their farming members to research and develop the technical expertise in an attempt to improve access for Southern African crops to international markets. These grower's associations are aimed at opening new markets for South African produce as well as ensuring that existing markets are retained.

You should also remember that each of the many export markets that are accessible to South Africa is further divided into wholesale and retail sectors. The performance of these many different markets varies from year to year depending on such factors as the type and volume of competitive products.

The situation is further complicated by the fact that it is not always possible to produce high quality produce of the kind the export market requires in the specific climatic area in which the farm is located. Market opportunities for fresh produce especially are highly dependent on the quality and timing of delivery.

From a business point of view, it is advisable for a grower to spread risk of his operation, by securing a range of markets.

This can be achieved by producing a variety of crops and cultivars because:

- No produce producing area can produce the ideal quality fruit at the ideal time for all crops and cultivars; and

- Fresh fruit markets may change over the course of a season and are not always accessible to all fruit types.

Selecting crops and cultivars that are suited to specific markets given the particular geographical and climatic constraints is the critical challenge. For this, **high quality market research** is vital.

THE PROCESS OF MARKET RESEARCH

The market research process involves a number of key steps:

- ***Consumer Analysis*** – Since all marketing plans should begin with a look at the all-important consumer, the first step is to conduct a consumer analysis. Consumer analyses identify segments or groups of consumers that have similar needs so that marketing efforts can be directly targeted at them.

- ***Market Analysis*** – The second step is to carry out a market analysis. A market analyses looks at the broader view of potential consumers that could be included in the market location, size and trends.

- ***Competition analyses*** – is conducted to ascertain your position as a supplier, relative to that of your competition.

- ***Distribution Channels*** – Once you know where you stand in the market, you need to analyse available distribution channels and networks. The efficacy of the distribution network influences the price you can charge, whilst still making a profit.

- ***Marketing Mix*** – This is followed by the development of the marketing mix that includes the well-documented five P's of marketing, being:

    - Product
    - Place
    - Price
    - Promotion
    - People

- ***Financial Analysis*** – Lastly the financial analysis of the marketing plan is compiled.

RESOURCES REQUIRED FOR MARKET RESEARCH

Market research is expensive because is requires the services of dedicated specialists. It is too expensive and impractical for every farmer to do his own market research. In the case of fresh fruit exports, the budget for carrying out such a full market analysis can run into hundreds of thousands of Rands. Farmers can form farmer groups together with exporters and jointly fund such analyses or decide to carry out only parts of the total process. This would depend on the specific objectives of the research program. Where a grower's association exists, the farmer can join such association and reap the benefits of market research and access services provided by the association. Normally the Growers association and its activities are funded through a levy that is charged on the produce sold or exported.

In most cases where an individual farmer is faced with planting decisions based on marketing prospects, he will consult colleagues, technical experts, exporting companies and market agents. In this way he is able to build up enough general information to guide his decision without incurring the cost of hiring marketing professionals.

Where investment in the opening of new production areas or the launch of a new cultivar is contemplated, the market research process, whether it involves a group effort or even a relatively small-scale investigation, may requires the services of specialists, either as those within an established grower association or as consultants.

MANAGING MARKET RESEARCH

Market research has to be managed, meaning that each stage has to be carefully planned, with appropriate target dates and milestones put in place. Out-sourced services can be costly and careful budgeting must be applied to every phase of the marketing plan. It must also be carefully decided which aspects to include and which to leave out of the process.

Once market research has been completed and a marketing plan has been developed the recommendations of the plan must be followed. Implementation does not only refer to basing decisions for new plantings on the results of the market research, but also implies the adjustment of ongoing production practices to agree with the requirements of the market.

THE MARKETING MIX

INTRODUCTION

A **marketing plan** attempts to clarify and characterise the market, the customer and the environment in which the business is being conducted. The **marketing mix** can be viewed as the controllable part of the marketing plan. It is the farmer's responsibility to control these factors.

Often referred to as the four principles of marketing, **product**, **place**, **price** and **promotion**, as proposed in the well-known book by E. Jerome McCarthy entitled ***Basic Marketing***, these four principles can be expanded to include a fifth P, being **people**. These five principles are referred to as the marketing mix. This section explores the application of these principles to the marketing of fresh farm products.

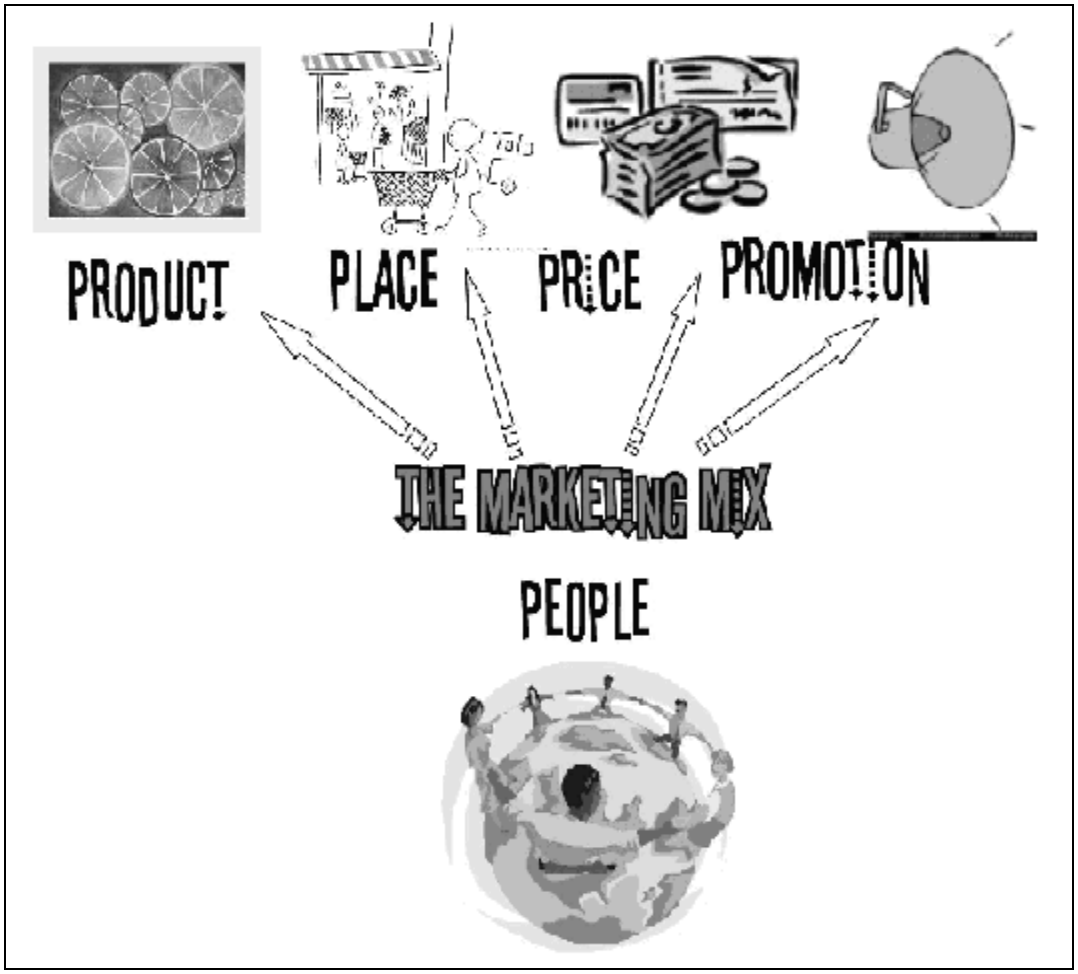


Figure 2.1: The marketing Mix

Product

The critical question that must be asked with regard to the product is: "What is the product and its characteristics that my target market wants?"

In order for a farmer to succeed, the product must offer clear and distinct value to the buyer. The product characteristics must also meet those expectations of the target market. Supply and demand is the ultimate judge and jury of success.

There may seem to be little opportunity for differentiating traditional crop or staple foods: after all, maize is maize. But on closer examination it is evident that there is ample scope for product differentiation using knowledge of market opportunities as revealed by market research.

For example, there are many different maize cultivars. Even the traditional maize crop comprises many different cultivars with different properties, each with their own features and characteristics of grain size, cooking time, colour, internal quality, general appearance, taste and nutritional value.

Markets differ in their preference for different maize cultivars and specifications, and these preferences change with time.

Market differentiation can also be achieved through techniques such as organic production, distinctive packaging, and by establishing a recognisable brand for the product. A product can further differentiate itself through building up a brand reputation of good quality. Consumers will come to associate a particular brand name with the product and with good quality and therefore seek this in their purchases.

The way in which the product is presented is also critical. For example, where direct delivery to the retailer occurs, such as packing for Woolworths, the product and packaging specifications are prescribed in detail by the retailer and have to be strictly adhered to.

If you are for example targeting the local processing industry, what is it that makes you an indispensable supplier to them?

If it is the bakkie trader or roadside hawker who is important to you, why would they buy your produce rather than that of your neighbour up the road?

Is your customer the impossibly difficult buyer at Pick 'n Pay or Woolworths, who in turn is trying to meet the needs of the buyers in his fresh produce section?

Or is it the buyer in Tesco's or Sainsbury's in the UK (two overseas retail groups similar to Pick 'n Pay and Spar) who is insisting on traceability, food safety standards etc, on meeting the needs of their own unique accreditation code, and in receiving product that meets the most stringent standard the world has ever known?

Each of these markets has such radically different needs and requirements, and each requires a completely different mix of product and marketing tools to successfully penetrate and maintain it.

You may be supplying all of these markets, but have you:

- Segmented them into the separate entities?
- Established what each one consists of?
- Identified their individual special product needs?

Place

The critical question that must be asked with regard to place is: "Where does my target market want this product?" or more critically, "How am I going to get my product to the target market?"

Place therefore has to do with the distribution networks for getting the product to the customer. It is important to analyse the distribution options, because the choice of channel influences the price you can charge, and consequently the profit you make.

Two questions should be asked to provide a basis for a decision on distribution:

- How can and should my product reach the consumer?
- How much do the players in each distribution channel profit?

By working through the answers to these questions it will become clearer how your product should be directed to the market.

The commonly used channel intermediaries to the consumer are wholesalers, distributors, sales representatives and retailers. For export fruit, distribution channels are highly specialised and the competitive environment enables the producer to select the appropriate inland transport provider and logistics service provider at the port terminals.

Very often decisions relating to transport and logistics are the result of negotiations with the company whom the grower has chosen to export and market his product. Joint decisions are taken for instance on whether product will be shipped in containers or in reefer vessels.

Moving fresh fruit by air is expensive and seldom a financially viable option.

Example:

Road transport of fruit into Africa is exposed to pilferage and border delays that compromise fruit quality. This leaves sea freight as the most viable transport option into Africa. Shipping lines have increased their ports of call and improved transit times to African destinations. An important issue remains placing the maximum number of cartons per pallet (payload) in order to provide the importer with optimal economic benefit on freight costs.

Placing fruit into local market destinations involves a trade chain of transporters and local wholesale market agents. The choice of service providers and markets depends on the outcome of the market research

Price

The critical question that must be asked with regard to price is: At what price can I sell my product to the customer to ensure the optimum sales but also the best possible profit margin?

The price at which the product is sold is critical. This is because a high proportion of the costs involved in producing and packing fresh fruit for a particular market are fixed. Distribution costs vary depending on who does it and where the market is located. Profit is highly dependent on the price earned in the market.

It has been said that the market price is the market price – take it or leave it. This is indeed the case in well-supplied markets where large volumes of product are moved at discount prices. In this case the retailer is able to exercise pressure on the supplier. In other cases, where the supplier or grower, has a product that is generally in short supply or is particularly desired by the market, he has more bargaining power and is in a position to more easily influence the selling price in his favour.

When produce of a particular variety or specification is in abundance, it is more difficult for the farmer to negotiate any form of advanced payment or minimum guaranteed price with the buyer or his export agent. Under such circumstances, the farmer may be forced to send his produce to the market and hope for the best. This is called selling on consignment.

Before deciding what price to ask, the farmer should have in mind some kind of pricing strategy. For example, he might decide to work on a cost-plus basis, whereby he simply calculates his costs and adds a desired profit margin. The farmer might otherwise decide to try to penetrate a particular market by going in at a specifically low price. On the other hand, he may go in at a high price and skim the market for a short period while competitive product is absent.

Whatever pricing strategy is followed, price is a critical aspect of the marketing mix.

Promotion

The critical question that must be asked with regard to promotion is: How can I promote my product so that my target market knows what a wonderful product I have available?

Promotion refers in essence to communication with the customer. In its simplest form, it means message sent, message received and message acted upon. If the product has been produced with the needs and desires of the customers in mind, the communication necessary for getting customers to buy it is through the message used to reach them.

Promotion includes all the advertising and selling efforts of the marketing plan. Goal setting is important in developing a promotional campaign. The ultimate goal is to influence buyer behaviour, and therefore the desired behaviour must be well defined. Different products require different promotional efforts to achieve different objectives.

For example, if the intention is merely to make the market aware of your product, the promotional mission will be to inform the market about the product and to communicate a 'need' message. If the intention is to generate interest in the product, a compelling message is required with the idea of solving a need. If the intention is to generate loyalty, the message should reinforce the brand or image with special promotions.

Whether the idea is to pull buyers to a sales outlet or to push a retailer to stock and sell, there are five general categories of promotional effort, being:

- Advertising;
- Personal selling;
- Sales promotion;
- Public relations;

- Publicity; and
- Direct selling

There are many techniques for implementing promotional efforts. In the case of promoting the sale of fresh fruit, much depends on the specific market and market segment, and on whether the promotional campaign is generic to a fruit type and farmer community, or highly specific and applicable only to fruit of a particular cultivar from a particular farmer at a particular time. Promotions may also take the form of general media messages, or so-called above-the-line promotions, or price discounts and in-store promotions, referred to as below-the-line.

Promotions are communication tools. Which, how and when these tools are used depend on specific circumstances.

People

The critical question that must be asked with regard to people is: Who do I need and how do I need to manage my workforce to achieve the requirements of the market?

Neither efficient production nor any of the above components of the marketing mix can be achieved without a productive and motivated workforce.

Practical example of applying the Marketing Mix in Agriculture:

Marketing in a beef farming enterprise

Marketing has always been essential for a beef farming enterprise to be effective. Competition with imported, subsidized meat and from white meat producers has placed pressure on beef farmers to improve their marketing skills. Furthermore, there is an emerging awareness that a market must be found or created before beef animals are slaughtered. Keeping beef in cold rooms is an option, albeit a costly one for which funds must be obtained. In the past, moneys levied from the sale of slaughtered carcasses were used to fund a system of cold storage. On the other hand, animals kept on the farm continue to eat, draining resources and leading to over finished animals at slaughter. In times of beef shortages, there is no problem because all available carcasses are sold. However, in the past, when large numbers of cattle were slaughtered, beef prices plummeted. A drop-in prices could favour consumers in the short term, but beef farmers with high input costs, will not be able to cope under conditions of unstable market prices. Thus, planning is essential.

Marketing channels

Although some farmers slaughter in their own abattoirs and sell the meat through their own

butcheries, most beef farmers sell live animals:

1. Out of hand
2. At a farmer's association auction
3. An auction held privately
4. To a feedlot or through a custom feedlot
5. For slaughter at an abattoir - either directly or after on-farm fattening (feedlot or pasture or veld finishing).

With out of hand sales, no commission is payable and usually the buyer provides his own transport or, where a farmer provides transport, the buyer pays. When animals are taken to a local auction (usually a farmer's association sale), the seller is responsible for the commission payable to the auctioneer, although there are some auctions where the buyer pays the commission. The seller pays for the transport to the sale yard or the return of animals if not sold, and the buyer pays for the transport of animals sold. Usually, no commission is payable to an auctioneer when animals are not sold. With private auctions, the same rules usually apply as at farmers' association auctions; although sellers can negotiate the terms they want with the auctioneer, within certain limits.

Feedlotters usually buy at auctions, but often have agents visiting farmers or have known clients from whom they obtain animals for their feedlots. However, there are custom feedlots where a farmer sends his livestock for fattening. The farmer pays a management fee as well as for the feed costs and treatments *e.g.* vaccination, dipping, dosing, implants and treatment of sick animals. With custom feedlots, cattle remain the property of the farmer and at the end of the feeding period the farmer can decide where he wants his animals sold or whether he wants them returned to his farm.

Selling animals through an abattoir is usually done through an agent or the owner of the abattoir. The farmer must ensure that the animal is fat enough and is responsible for transport to the abattoir as well as for the slaughtering fees. In return, the farmer is paid for the carcass, the hide and the offal, which includes the head and trotters. With some small abattoirs, the abattoir owner takes the hide and offal in lieu of the slaughtering fee. It is advisable to investigate costs because there are times when the prices of hides and offal are high when it could be better for farmers to pay the slaughter fee and retain the hide and offal price.

Because selling procedures are so variable, it is advisable for sellers to check all steps and responsibilities for costs before accepting an offer to sell animals.

Beef price changes

Carcass prices tend to fluctuate sharply, and a thorough study is necessary to determine the best time to sell. Factors that should be considered include the fact that at some abattoirs all carcasses slaughtered in a day must be sold the same day. At other abattoirs, carcasses are loaded into fridges over some days, after which they are all put on auction.

It is noteworthy that abattoirs are considered quarantine areas and any animal entering the area may not leave it again *i.e.* it must be slaughtered.

Daily, weekly and monthly carcass price fluctuations

Beef prices at controlled abattoirs fluctuate over the day, different days of the week, and different months of the year. Daily and weekly fluctuations tend to be unpredictable and can move sharply from a low to a relatively high price. Average weekly prices at Cato Ridge abattoir for the period July 1995 to June 1996 are reflected in Figure 2.2.

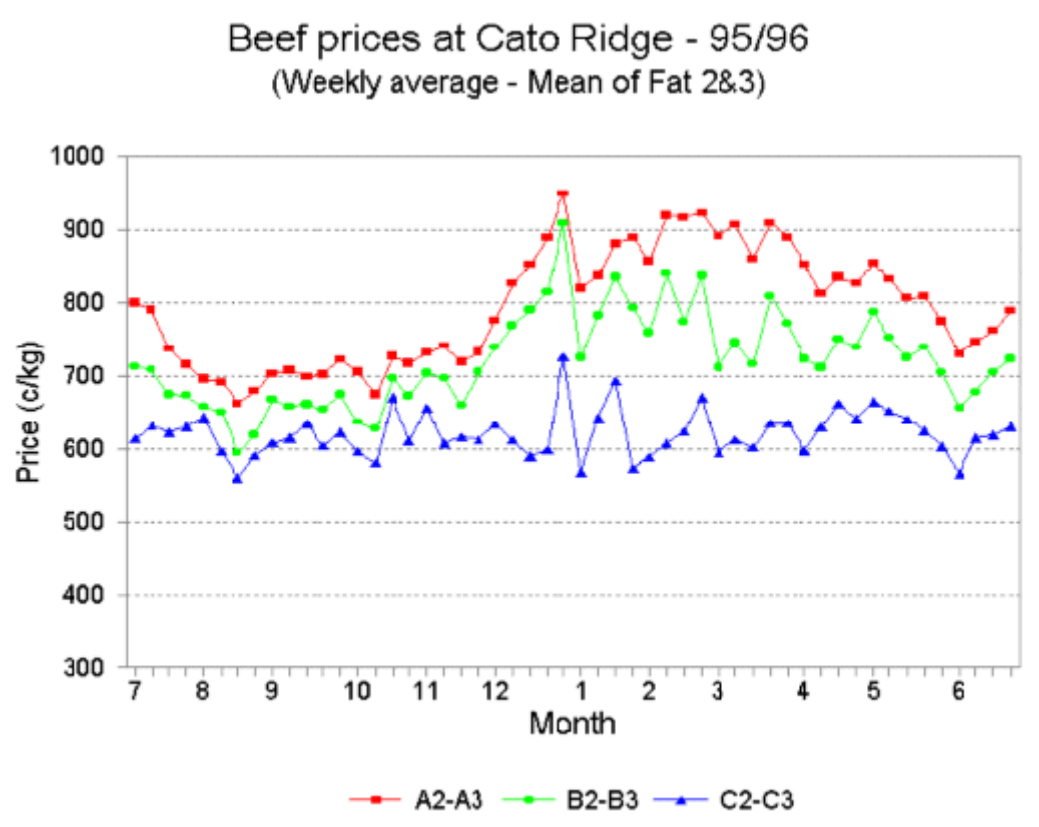


Figure 2.2. Weekly beef prices at Cato Ridge abattoir for the period July 1995 to June 1996.

Daily and weekly price fluctuations are difficult to predict and are affected by supply and demand, as well as factors such as short weeks when a holiday within a week plays a role or by strikes which arrest slaughtering.

On average, over the year, prices tend to rise from September/October to December, whereafter they gradually decline to June and remain relatively constant up to September. Although this is the pattern, many factors can affect the pattern.

Seven-year beef price cycle

In the past, beef carcass prices tended to remain relatively stagnant for a period of 5 years, after which there were sharp increases over a two-year period when prices doubled. Thus, from 1980/81 to 1985/86, the average price of carcasses at City Deep abattoir (Figure 2.3), remained relatively constant, where after prices doubled up to 1987/88. Prices again remained relatively stagnant for five years before the price increases of 1992/93, although a doubling of prices did not materialise at that time. Up to 2001, prices fluctuated between R8.00 and R10.00 per kg. Although it can be expected that a tendency for prices to rise sharply followed by periods characterised by small increases will continue, it is likely that these cycles will follow the American trend, where the cycles occur, but the time period is very variable. In any event, in South Africa, it seems that imports are placing a ceiling on the price of local beef.

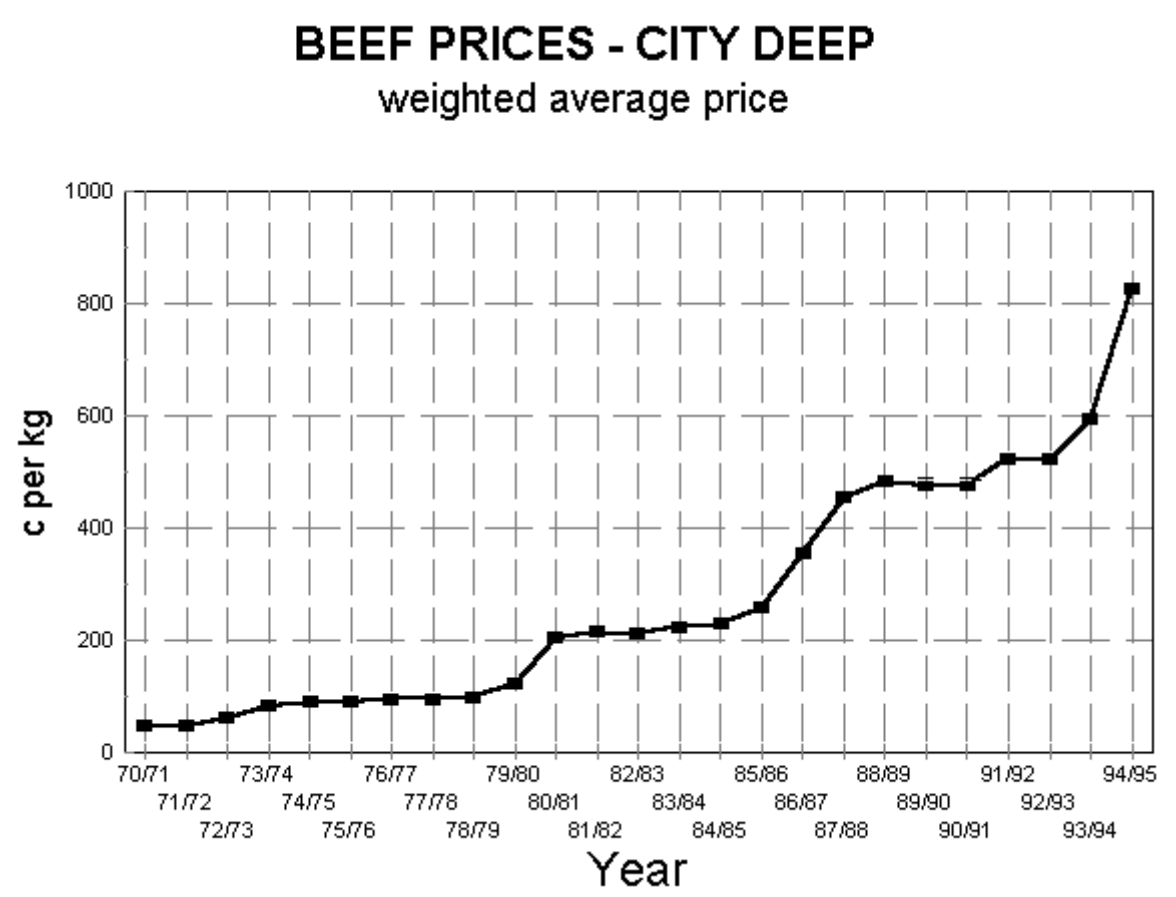


Figure 2.3. Average price of beef carcasses at City Deep Abattoir over all grades from 1970/71 to 1994/95.

It is noteworthy that during the 5-year periods of relatively stagnant prices, weaker price relative to carcass prices were high at the beginning of this period, whereafter the weaker prices declined to relative levels much lower than the carcass prices.

Table 2.1. Example of costs associated with marketing a steer.

COSTS	
Steer - 250 kg at R4.50/kg	R1125.00
Feed for 150 kg gain at 6,5:1 and cost of R490/ton	R477.75
Veterinary costs	R15.00
Management, labour and transport	R20.00
Mortality (1% of mean value)	R11.25
Interest at 17,25% for 100 days (on value of steer only)	R53.17
MARKETING	
STEER - 400 kg - 54% - R4.86/kg	R1944.00
Offal and hide	R215.00
Agents commission, transport, slaughter fee etc.	R242.56
Profit/Loss	R214.27

Marketing cull cows

Categories of cull cows

1. Cull heifers.
2. Empty cows that have lost their calves.
3. Empty cows that did not reconceive.
4. Old cows.
5. Cows that must be culled because of injury.

Major options

1. Sell soon after weaning (May)
2. Hold and fatten for sale later
3. Overwinter cheaply and fatten on veld next summer

The calculations for selling cull cows are the same as for sending a steer to the abattoir.

Profitability of on-farm feedlotting is affected by:

1. Buying price (or initial value).
2. Selling price.
3. Feed cost - which is dependent on the cost of the feed and the feed conversion ratio.
4. Marketing cost.
5. Mortality.
6. Veterinary costs.
7. Management, which includes:

Feedlot management.

Ability to predict selling price.

Evaluation of suitability of animal for feedlotting.

Ability to obtain cheap food either by effective buying or by using home grown feeds.

MARKETING BUDGETS

INTRODUCTION

Marketing is more than just selling and advertising of goods to customers. It is satisfying the needs and persuading them to buy more products.

Effective marketing of any farm starts with a plan of how this will be achieved through, for example, promotion of the product, advertising and public relations.

Marketing objectives should not be set until all relevant information on the product, the market and the consumer is available. Consumer behaviour and motivation must be thoroughly assessed.

Once marketing objectives has been set, an **implementation plan** is developed. The marketing plan should have promotion of the product as an integral part. It must then be decided what basic message is to be delivered, to the target audience and what the intended effects may be.

MARKETING BUDGET

Once the decision has been taken on what needs to be done and how, a **marketing budget** can be developed. A marketing budget tells us the funds that will be required to finance the marketing plan. Furthermore, the budget will also determine how and when the money will be spent. The marketing budget indicates the affordability of the plan and how its execution will impact on monthly cash-flow.

The marketing budget can therefore indicate how the marketing plan measures up to selected benchmarks and whether the plan can be carried out as designed, or whether is has to be modified or trimmed in some way.

The marketing budget provides vital information for decision-making regarding the wisdom of committing funds to such issues as promotion, advertising and public relations.

COMPONENTS OF A MARKETING BUDGET

You need to decide how much money you intend to invest in marketing as a percentage of your projected gross sales. You can break it down on a monthly, quarterly or annual basis.

Ideally you will have already determined the amount of your marketing budget when you have created your farm's various financial statements. The figure you will choose will depend greatly on your type of business on the farm and your goals.

SHORT, MEDIUM AMD LONG-TERM BUDGETS

Creating awareness of and loyalty to a brand or trade name takes time. Confidence in a product is normally built-up over a period of several years, and provision has to be made in the marketing plan and budget for ongoing activities.

When an investment has been made in entering a product into the market, it is unwise not to continue bringing its unique attributes to the notice of potential buyers. The ongoing promotion of the Coca-Cola brand is a good example of this. It is necessary therefore to make provision in marketing planning and budgeting for marketing activities and costs of a long-term nature.

Other costs and activities are of a medium- and short-term nature. Most often such plans and the resultant costs will be governed by the current state of the market and its perceived response to below-the-line promotional activities.

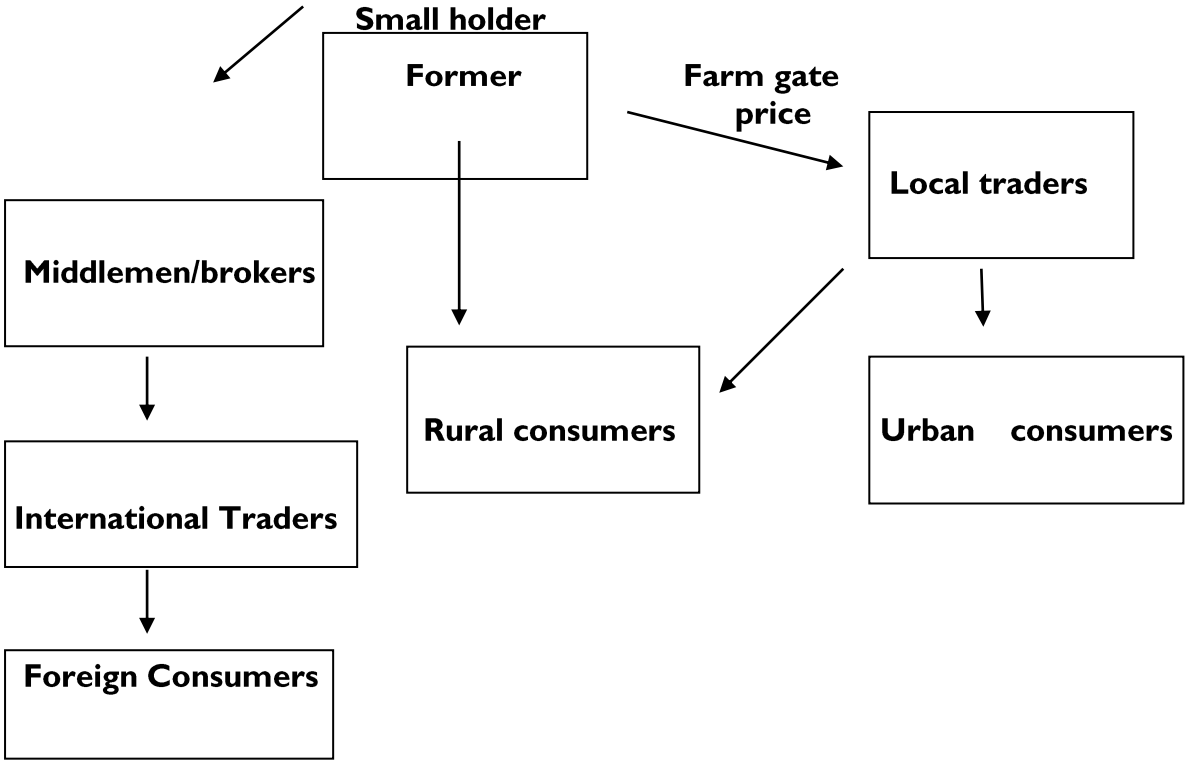
MONITORING THE BUDGET

It is the responsibility of the farmer to monitor the budget during which there is an ongoing comparison of actual expenditure against the budget.

Marketing activities is an expenditure that adds value to your farming business. It should not however, be that expensive so that the profit you make on your produce decreases.

EFFECTIVE DISTRIBUTION OF FARM PRODUCE

MARKETING CHANNELS FOR PRODUCE FROM SMALLHOLDER FARMS



The figure above illustrates the different paths that followed from produce harvested and sold by smallholder farmers until it reaches the consumer. Produce from smallholder farmers is sold to consumers and traders at the farm gate, usually through informal transactions where prices and terms of exchange are unofficially negotiated.

Smallholder farmers face difficulties in accessing markets and as a result, markets do not serve their interests. Technical and institutional constraints make it difficult for them to access commercial markets.

Good roads, transportation and communication links are prerequisites to market access. Proper post-harvest handling and storage contribute in ensuring quality maintenance for perishable agricultural product.

Smallholder farmers often rely on open-air storage and therefore are keen to sell produce almost immediately after harvesting, leading them to sell their product at a lower price.

Road infrastructure and transport availability have an influence on smallholder market participation, especially if they are located in rural areas. Inability to transport products in time may result in produce spillage and losses.

SELECTING A DISTRIBUTION CHANNEL

For fresh produce in particular, the distribution channel refers to the way and means by which the farm product is moved from the farm to the market. The mechanisms used vary depending on where the market is located in relation to the farm and on the requirements of the market. Commonly used distribution channels include wholesalers, distributors, sales representatives and retailers.

The preferred packaging required by the target market for fresh farm products is an important role in the choice of distribution channel. Fruit destined for the local wholesale market is usually packed either into jute or plastic pockets, usually in 10kg or 5kg units, or into 15kg cartons. Cartons are stacked onto wooden palletised and transported by road or rail. Pockets are either stacked directly into trucks or palletised for the journey to the market.

Informal traders who collect fruit directly from the pack house in their own vehicles may load fruit loose into their vehicles.

Fruit for export is packed into specified cartons, most commonly 15kg, with dimensions that are configured for palletisation. Stacked pallets are either loaded onto vehicles or rail trucks, or into shipping containers at the pack house.

We can now see that there are many different forms and ways in which fresh farm products leave the farm for their journey to the market. Some products are transported following a cold chain. In the case of lettuce, the harvested lettuce is transported from the field to a packing shed that is refrigerated. The lettuces are packed using specific packaging, under refrigeration, store in cold rooms and transported to the retailer in refrigerated trucks by road.

The farmer or pack house decide which markets to serve, ensure that the packaging form is aligned with market requirements and is cost effectively utilised. The farmer or pack house then decide, alone or in consultation with the market agent or exporting company, how the product will be transported to the market or port terminal.

In the case of exports, decisions also have to be taken about which logistics service provider and shipping company to use. The cost of transporting the product to the markets of choice in good condition depends on the efficiency and capability of the agencies used.

Deciding on which logistics service provider in the distribution channel to use depends on:

- The ability to provide the desired service
- The reputation of the service
- The cost of the service

TRANSPORT MODES

The choice of distribution mode has cost implications and therefore has an influence on the distribution budget.

The farmer or pack house has to decide which mode of transport to use to convey the packed product to the market. Cost is the main consideration in making this decision, but not the only one. Other factors include the practicality, reliability, reputation, and general standard of service delivery associated with the different modes of transport and transport contractors.

Export fruit has to be transported from the pack house to a local depot or port, from there to an overseas port, and from the overseas port to an overseas depot or market. Different modes of transport are in most cases used for the different sectors of this journey.

The inland part of the transport leg can be completed by road or rail, or a combination of the two, depending largely on where the pack house is located. Almost all cooperative pack houses and some independently run pack houses are located on rail sidings, in which case rail transport is the logical option. However, in many instances, poor rail services, as a result of unreliable capacity, time delays and uncompetitive tariffs, have resulted in road transport being more attractive. Ultimately, market forces will determine what mode of transport is used.

Before the 1980's, a high proportion of farm products were transported from the interior of the country by rail. Today the situation is very different, with a much higher proportion being transported by road, simply as a result of competitive rates and service delivery requirements driving producer decisions.

Sea freight accounts for virtually 100% of the transport mode used to convey farm products from South Africa to its various export markets. This is even the case with African markets other than those with borders close to South Africa.

On rare occasions air freight is used for exports, but this is usually early in the season of a popular cultivar, when a producer and his export agent decide to be the first on a poorly supplied market. Speciality crops that are placed into niche markets are often transported by air. An example of this is airfreighting of blueberries from South Africa to the UK. South African Blueberry exports occur in the months where blueberry is not harvested in Europe. The consumers are then willing to pay a "levy"' on the produce. In some instances, market prices may, for a short period of time (days), justify the high cost of airfreight.

On arrival at overseas ports, the palletised farm product is conveyed most often by road transport to depots or directly to retailers in the case of supermarkets.

In the case of locally marketed fresh farm products, depending on the quantities of produce involved, the proximity of rail stations, the location and nature of the market to which the products are being sent, and the price quoted, either road or rail is used. Since relatively small volumes of product are sent by any single producer to any specific market, road is the most commonly used transport mode.

COOPERATIVE MARKETING AND DISTRIBUTION

A cooperative is an organisation comprising a number of individual farmers as its members. A cooperative is formed to benefit from the economies of scale that their collective supply and marketing of product can achieve. This benefit can take various forms, most of which relate to the increased bargaining power that large volumes of products can achieve over smaller, fragmented volumes.

In terms of the marketing and distribution of fresh farm products, the cooperative has certain features that make it either attractive or unsuitable as a structure for individual growers to use.

The members of the cooperative usually comprise a number of individual farmers located within close proximity of distribution channels. As a group the producers can offer the market-sustained volumes of a range of products or cultivars over an extended period.

The management of the cooperative negotiates with distribution service providers and evaluates market segment options on behalf of its members. Armed with the supply volumes of its members,

the cooperative is able to negotiate from a position of strength and is usually able to conclude favourable contracts with export agents and importers.

One factor that can weaken the cooperative's bargaining power is the potential variability of the quality of produce emanating from its range of producers. All cooperatives have strict quality management systems in place, but quality variation is an inherent risk in a system where fresh farm products are supplied from many individual producers.

- **Distribution Channel Budget**

  Most costs associated with the production and packing of fresh farm products is fixed.

  Since there are various distribution options and logistics service providers from which to choose, costs can be saved in this area. It is therefore important to compare prices for the various stages of the distribution chain and use this information to create a distribution channel budget.

  The distribution budget serves as the financial expression of the distribution plan and in its formative stages is a useful tool for comparing different options.

- **Monitoring Distribution Channels**

  It is important for the farmer to enter into a contract or service-level agreement with the chosen transport and logistics service provider. In this agreement, the required service delivery standards should be clearly described.

  The actual service delivery is measured and monitored against this agreement, and payments are made accordingly.

  To ensure ongoing compliance by the service provider, it is important to maintain short interval control so that service delivery problems can immediately be brought to the attention of the service provider and appropriate action taken.

- **Monitoring the productivity of Transport providers and Distributers**

  The most obvious way of measuring the efficiency of transport and distribution contactors involved in the fresh farm product supply chain relates to the final condition and quality of the product they have been responsible for conveying.

Fresh farm products are by nature, perishable products with a limited shelf life. Once the product has been produced, harvested and packed, time and temperature become the crucial parameters determining its quality and condition during and after the transport and distribution process.

CHAPTER 3

HUMAN RESOURCES MANAGEMENT IN AGRICULTURE

In this chapter we explore the following concepts:

- A basic understanding of the farm's HR policy
- Labour legislation
- Contracts and agreements
- Health and Safety rules

ESTABLISH A BASIC UNDERSTANDING OF THE FARM'S HUMAN RESOURCES POLICY

INTRODUCTION

In order to understand the concept of the word **policy,** it is necessary to investigate the process that leads to the formation of policies.

- The Government creates legislation, which forms the framework for an act.
- An act is a set of guidelines, which companies or farms should use to set up their internal policies.
- A policy is a company's (farm "s) interpretation of how they will implement that law within the workplace.
- Procedure is the methodology behind the implementation of that policy

DISCIPLINARY RULES

In the past these rules were often applied by management or a supervisor that had no legal basis but were implemented almost randomly according to their own interpretation of the situation.

There was often no written disciplinary policy to guide management or the workers.

Discipline was used as a big stick and the person who had committed the alleged misdemeanor had no way of defending their case.

Many farm workers understand disciplinary rules as a punishment system that normally has a negative outcome for the worker, whereby threats of punishment are used and written warnings are issued.

According to the Basic Conditions of Employment Act of 1983 – the discipline and grievance procedure should cover the following:

- Discipline is there to change behaviour in a constructive manner with the appropriate support by management.
- Rehabilitation should be the key stone for good discipline.

- Deterrence is to be used if rehabilitation has failed its purpose.

NON-COMPLIANCE TO FARM RULES AND PROCEDURES

The Basic Conditions of Employment Act of 1983 stipulates that nobody can be dismissed or punished unless they have had a disciplinary hearing.

There are certain offences for which you can be dismissed on the first offence and other offences for which a set procedure must be followed.

INCAPACITY

Poor Work Performance

Before an employer can dismiss an employee for poor work performance, the employer must first give the employee appropriate evaluation, training or guidance and a reasonable time for improvement. The employer must hold an investigation into reasons for the poor performance. Only if the employee still continues to perform poorly thereafter and the problem cannot reasonably be solved without dismissing the employee, will dismissal be fair.

Bad Health or Injury

If temporary incapacity will cause an employee to be away from work for an unreasonably long time, it will be unfair to dismiss the employee unless the employer first investigates all possible ways of avoiding this step. If the incapacity is permanent, the employer should try to find alternative work for the employee or adapt the work so that the employee is able to do it. The employer must make a greater effort to accommodate the employee if the employee was injured while at work.

Any termination of employment of the employee must be in accordance with a fair procedure and should be substantively fair.

There are three kinds of fair reason for dismissal. These are:

- For **misconduct** (if an employee intentionally or carelessly breaks a rule at the workplace, for example, steals company goods)
- For **incapacity** (if an employee cannot perform duties properly due to illness, ill health or inability)

- For **operational** reasons (if a company has dismissed employees for reasons which are related to purely business needs and not because of some failing on the part of the employee).

MISCONDUCT

The workplace is entitled to set reasonable standards, workplace rules and/or codes of conduct to which the employees must comply.

Misconduct is deemed to be all behaviour of an employee that is regarded as unacceptable by an employer. There are certain behaviours that are commonly known to be unacceptable, not just for an employer, but for a society as a whole, for example theft and fraud.

An employee is guilty of misconduct or transgression when he/she wilfully or negligently and knowingly contravenes a workplace rule or standard.

The implication of not complying with company rules and regulations varies. The severity of acts of non-compliance will be stipulated in the policy document. Certain offences are deemed more severe than others. Repeated non-compliance may lead to harsher measures being taken and may result in dismissal.

INDIVIDUAL ACTIVITY

You have ten minutes to complete the following activity by indicating what type of dismissal, the offence would potentially lead to.

Termination of services due to:	Misconduct	Incapacity: Poor performance	Automatically unfair dismissal	Incapacity: Ill-health or injury	Operational requirements
Theft					
Fraud					
berculosis					
Retrenchment through insolvency					
Unable to work due to AIDS					
Participation in a protected strike					
Not meeting performance standards					
Insubordination					
Refusing during a protected strike to do the work of an employee who participated in the protected strike					
Loss of eyesight (driver)					
Abuse of Alcohol while on duty					
An employee exercise his rights in terms of the relevant Labour Act					
An incapacitating health problem					
Introduction of new technology which the employee did not know how to operate					
An employee's pregnancy status					
Use of Drugs in the workplace					
Assault of a fellow employee					
Unfair discrimination					
Sexual harassment					

At all times, the worker must be allowed to have representation and management must have a grievance procedure in place so that the workers have an avenue to voice any grievance.

Unions represent workers on some farms and they will represent or negotiate with management on behalf of the workers.

If the workers feel that they have a legitimate grievance that management is not listening to, then they can take up the matter with the Commission for Conciliation, Mediation and Arbitration (CCMA). CCMA offices are available in all nine provinces of South Africa.

HUMAN RESOURCE POLICY

Definition:

Human Resource policy- is a company's interpretation of how they implement the law regarding the management of the human component within the company. The policy will therefore describe all aspects that pertain to issues of concern to employees like training, leave, working hours, wages, company regulations etc.

This is a policy that briefly covers the following:

- The aims and function of the policy.
- Include an Induction Programme and Training Policy.
- The Farm's Interpretation of the Labour Legislation.
- Provides a set format for Labour Relations.
- Explains Salary and Wage System- Remuneration.
- Union Membership.
- Medical Aids and Benefits.
- Disciplinary policy.
- Employment equity policy, recruitment and selection policy.
- Job analysis, description and specification.

EXPLAIN AND IDENTIFY LABOUR LEGISLATION APPLICABLE TO THE WORKPLACE

In the previous session we looked at the workers and their interpretation of the human resources regarding the policy employment conditions specific as a disciplinary measure. This session will focus on the role of the human resource policy and its relation to labour legislation. The session is comprised of an activity whereby learners are to investigate the content of legislation that is applicable to the questions posed.

The legislation that applies to the workplace includes:

- Basic conditions of employment act, 1983.
- Occupational health and safety act, 1993.
- Wage act.
- Workmen's compensation act.
- Unemployment Insurance act.
- Labour relations act of 1995.
- Employment equity act 1998.
- Skills development act of 1998.

These acts are valuable tools to empower you as employee in the workplace:

Your facilitator will provide you with a copy of the following:

The Basic Conditions of Employment Act, 1983;

The act does not concern itself with wages but with conditions of employment.

It sets out the minimum conditions of employment covering those workers not covered by any other statutes or acts, bargaining council agreements etc.
It covers:

- Hours of work.

- Overtime and overtime pay.
- Work on Sundays.
- Contracts of employment.
- Termination of employment.
- Annual and sick leave.
- Protection from victimization.
- Record keeping by the employer.

Basic Conditions of Employment Act: Sectoral Determination 13: Farm Workers

This official piece of legislation applies the Basic Conditions of Employment Act to FARM WORKERS specifically.

It provides for, amongst others, the following matters:

- Wages
- Wage deductions
- Method of payment
- Leave types
- Hours of work
- Rest Periods
- Night Work
- Child labour
- Termination of employment
- Staff administration
- Overtime

Employment Equity Act of 1998

This Act sets out the conditions for the recruitment and selection of employees. This Act also deals with equality of workers regarding being treated fairly and without bias. This Act would form part of a workplace recruitment and selection policy. This policy would ensure the following points concerning employment:

- Fairness in selection policy and process.
- Taking into account the company's equity figures.
- Standard manner in which the advert is set out ensuring that nobody is excluded on grounds that are not pertinent to the function of the advertised position.
- Standard of short-listing that is open to staff and has set minimum criteria.
- Standard format for conducting interviews so that no artificial barriers are created.
- Establishing an interview panel that represents the diversity of the area in which the farm operates.
- Establishes a manner in which applicants can question why they were unsuccessful in an interview.
- Look at creating an environment that is conducive to the best possible feedback from the applicant.

Labour Relations Act of 1995

Unfair dismissal disputes in which unfair discrimination is alleged must be dealt with in terms of the Labour Relations Act. The Act deals with all issues pertaining between employer and employee.

UNDERSTAND CONTRACTS AND AGREEMENTS APPLICABLE TO YOUR WORKPLACE

INTRODUCTION

In the past, there was often no description of what you were expected to do in the workplace. Often the manager would just assign you a task to perform and this could be any type of work on a farm. This often resulted in devastating accidents as you were expected to work with dangerous equipment or chemicals and were not given the appropriate training. In the past these systems lead to disagreements and even unfair dismissal.

There was never any system in place against which you could compare how you were performing in your work. This meant that it was very hard to get promotion or develop your workplace skills, as the system did not allow for it.

Many farm workers were employed on a day-to-day verbal agreement and could lose their jobs for many different reasons. They had no sense of loyalty to the workplace and it was not in their long-term interest to give their utmost. Fortunately, there is legislation in place to protect both the employee and employer.

JOB DESCRIPTION

A job description is a detailed description of the work an employer has assigned an employee. On a farm this may include the worker's specific tasks according to season.

DEVELOPING A JOB DESCRIPTION

Step 1: Job analysis

Before a job description can be documented, the farmer has to do a job analysis; and can be best described by looking at the tasks involved in a job analysis:

- What job has to be done?
- Why must it be done?
- How must it be done?
- How much supervision is required?

- What tools and equipment are required?
- How much expertise is required?
- What physical strength is required?
- How much time is needed for certain aspects of the job?

Step 2 – Define job Objectives

Once the job analysis has been completed, the **objectives of the job** can be developed. Job Objectives refer to the purpose of the job. It also refers to the result that is sought by initiating the job. In order to develop the job objective, management must identify the following:

- What section of the farm will you work in?
- The job title?
- Aims of the job?
- Most important duties?
- Working conditions- leave, hours of work, shifts, dangerous work, overtime, and wage?
- Equipment or tools required?

Step 3 – Define the Job Specification

The final step in developing job description is defining the **job specification**.

Job Specification is the detail that describes the personal qualities required of the person in a specific job. In order to develop Job specifications management must identify the following:

- The qualifications, skills, experience and personal qualities required.
- Whether a person works alone or in a team.
- Whether you deal with the public or not.
- Whether you have to be on standby or not.

CONTRACTS

Employment Contract

By law you are obliged to enter into a written contract when appointing a worker on a permanent basis.

The following information should be included in such a document:

- the full name and address of the employer;
- the name and occupation of the farm worker or a brief description of the work for which the farm worker is employed;
- the place of work and where the farm worker is required or permitted to work at various places;
- the date on which employment began;
- the farm worker's ordinary hours of work and days of work;
- the farm worker's wage or the rate and method of payment;
- the rate of pay for overtime work;
- any other cash payments that the farm worker is entitled to;
- any food or accommodation payment that the farm worker is entitled to and the value of the food or accommodation calculated in accordance with clause 8;
- any other payment in kind received by the farm worker;
- how frequently wages will be paid;
- any deductions to be made from the farm worker's wages;
- the leave to which the farm worker is entitled to; and
- the period of notice required to terminate employment or if employment is for a specific period, the date when employment is to terminate.

Attendance Record

Law requires that you have a daily record of employee attendance. A basic system is required where employees can sign on for duty and sign off when they leave the premises. These documents can also be extremely helpful to support disciplinary action, overtime calculation and even to determine if an employee was on duty when injured!

An example of an attendance register has been placed in your Personnel Admin File.

Pay Slip

Employers must give workers the following information in writing when they are paid:

- Employer's name and address
- Worker's name and occupation
- Period for which payment is made
- Total salary or wages
- Any deductions
- The actual amount paid
- Employer's registration number with the Unemployment Insurance Fund and the contribution to the fund.
- If relevant to the calculation of pay:
    - Employee's pay and overtime rates
    - Number of ordinary and overtime hours worked
    - Number of hours worked on a Sunday or public holiday
    - The total number of ordinary and overtime hours worked in the period of averaging, if an agreement to average working time has been concluded.

PERFORMANCE AGREEMENTS

This is an agreement by both parties that they agreed to a measurable delivery of service.

The Importance of a Performance agreement:

The Performance agreements make the worker's job visible. It is a power tool towards transparency. It is a systematic way of making the best use of resources. It defines what the basic purpose of a certain job is and in which direction effort should be directed.

The Performance agreement contains the on-going standards by which to judge the work on a farm and the end results. It is a management tool for performance appraisal. (Measuring how well work has been done). The performance agreement may also provide the framework for effective delegation.

Because it establishes acceptable levels of performance, the performance agreement serves as a continuing reference point that will help to identify and analyse strengths and weaknesses (development areas in the farm worker's performance) in current performance and to formulate short-range development plans.

Performance agreements contain three key elements: Results, ways of achieving the result and how the result will be measured.

PERSONNEL EVALUATION BY THE SUPERVISOR

Definition:

Personnel evaluation: To evaluate personnel is to analyse, interpret and determine the worth or quality of work completed, and the results achieved. This evaluation is made according to the job description and the performance agreement.

In order for personnel evaluations to be effective, prior agreement on job description and performance agreement is crucial. E.g. If a packer has agreed to pack 50 crates per day, the evaluation of performance becomes simpler as the packer would be in the position to self –evaluate.

Within a farming workplace, peer-evaluation can be effectively applied to determine work performance.

It must be re-emphasized that is essential that the worker can evaluate his or her own performance according to a set list of criteria, which is in the job description. This also means that the employer can evaluate the employee. This allows for either party at any time to identify the need for capacity building to be able to perform at the set or higher levels.

The job description forms the basis for all other situations that arise on the farm - the job description will be a positive tool for both management and worker if used properly.

From the personnel evaluation it is also possible to determine the development needs of the employee.

In the farming environment it is important to transform inputs into outputs. Employees must have the knowledge and skills to do this effectively. If they do not have the required knowledge and skills, they have to be trained.

EXPLAIN AND ADHERE TO HEALTH AND SAFETY RULES AND PRACTICES

HEALTH AND SAFETY RULES AND PRACTICES

People continuously try to **improve** and find **better health and safety protection measures**. This information is put together to form a standard, which is used to make up health and safety laws.

The main objective of the **Occupational Health and Safety Act** (No 35 of 1993) is to ensure that employees can perform their daily work without exposure to substances or conditions which will cause them death, disease or injury.

You need to make sure that you are aware of the rules that apply to health and safety in your workplace.

You need to make sure that you are aware of the rules that apply to health and safety in your workplace.

Duties of the employer:

The employer must provide and maintain healthy and safe environment for you the worker. They must:

- Take steps to **eliminate health and safety hazards** before issuing safety gear as a preventative measure.
- **Enforce** health and safety measures.
- **Provide information, instruction** and **training** to ensure health and safety of workers.
- **Act** on reported **unsafe** or **unhealthy conditions, behavior, or incidents** and **take steps to remedy** them.

Duties of the worker

You must be sure to:

- Take care of your own health and safety. Obey all health and safety rules.
- Act responsibly so that others are not put at risk due to your behavior.

- Co-operate with your employer and the Health and Safety Rep so that they can comply with legislation.
- Report any unsafe or unhealthy behavior by the end of the shift during which you noticed it.
- May not interfere with or misuse any safety equipment or personal protective clothing.

Your Health and Safety Rights

- You have the right to know what machinery, equipment and substances you will be working with.
- You have the right to receive full and proper training regarding the use and proper care of equipment and substances.
- Free protective equipment and clothing as required by your job.
- A health and Safety Rep to take care of your interests.
- You have the right to refuse to perform certain tasks if your employer has not taken the necessary steps to ensure your health and safety.

As an example, the principles of the Occupational Health and Safety Act with regards to the storage of Agro-chemicals and fertilizers will be provided.

HEATH AND SAFETY REPRESENTATIVES

What are health and safety representatives?

They are full-time workers nominated or elected and designated in writing by the employer after the employer and workers consulted one another and reached an agreement about who will be health and safety representatives. Furthermore, they must at least be familiar with the circumstances and conditions at that part of the workplace for which they are designated. Agreement must also be reached on the period of office and functions of the health and safety representative and must be settled amongst the employer and the workers.

How many health and safety representatives must be designated?

A representative must be designated for every workplace consisting of 20 or more workers. Therefore, where only 19 workers are employed, it is not necessary to designate a representative.

Health and safety representatives are entitled to:

- ✓ *Health and safety audits*

  Representatives may check the effectiveness of health and safety measures by means of health and safety audits.

- ✓ *Identify potential dangers*

  Representatives may identify potential dangers in the workplace and report them to the health and safety committee or the employer.

- ✓ *Investigate incidents*

  Representatives may together with the employer investigate incidents, investigate complaints from workers regarding health and safety matters and report about it in writing.

- ✓ *Make representations*

  Representatives may make representations regarding the safety of the workplace to the employer or the health and safety committee or where the representations are unsuccessful, to an inspector.

- ✓ *Inspections*

  As far as inspections are concerned, representatives may –

  - inspect the workplace after notifying the employer of the inspection
  - participate in discussions with inspectors at the workplace and accompany inspectors on inspections
  - inspect documents
  - with the consent of his/her employer, be accompanied by a technical advisor during an inspection.

HEALTH AND SAFETY COMMITTEE

What is the purpose of health and safety committees?

Members meet in order to initiate, promote, maintain and review measures of ensuring the health and safety of workers.

When must health and safety committees be established?

At least one committee must be established when two or more representatives are designated.

What do health and safety committees do?

The committees only deal with health and safety matters at the workplace or sections thereof for which such committees have been established. Generally, health and safety committees have the following functions:

- *Make recommendations*

  A committee must make recommendations to the employer about the health and safety of workers. Where these recommendations do not lead to solving the matter, the committee may make recommendations to an inspector.

- *Discuss incidents*

  A committee must discuss any incident that leads to the injury, illness or death of any worker and may report about it in writing to the inspector.

• *Recordkeeping*

A committee must keep record of every recommendation to the employer and every report to an inspector.

REGISTERING FOR WORKMAN'S COMPENSATION

The Compensation Fund is the fund from which claims are paid to employees that are hurt in the cause of duty.

All employers who employ one or more workers in connection with their business or farming activities are required to register with the Compensation Fund.

Step 1: Fill in the form

Employers must fill in the W.As2 form. You can get the form at any labour centre or on the website – a copy is in your Personnel Administration File.

Employers must make sure that they complete all the questions on the form. If the Compensation Fund has to follow up on information that they did not complete, it may take a long time to be registered.

Step 2: Send in the form

When they send the form, employers must also include a copy of the registration certificate from the Registrar of Companies if they are a company or closed corporation; or their ID document, if they are sole owners of the business.

Employers can send the form by mailing it to:

PO Box 955

Pretoria

0001

INJURY ON DUTY – HOW TO ADMINISTRATE

Step 1:

The moment an injury occurs, where an employee must get *outside medical treatment, part A* page 1 of the *Employers Report of an Accident (*W.Cl.2) form must be completed. Detach "Part B" (an automatic copy of "Part A" page 1) by tearing it at the perforation, hand "Part B" to the employee and request him/her to hand it to the doctor/hospital concerned. **In serious cases,** "Part B" must be handed to the emergency services personnel who have responded to the emergency call.

It make sense to keep partially completed W.Cl2 forms and certified copies of all employee's identity documents in the First Aid Box, so that they are readily available when needed.

Step 2:

Once the employee has been taken care of, the employer must obtain the *First Medical report* (W.Cl.4) from the Doctor, complete page 2 of the W.Cl.2 form and send the completed pages 1 and 2, together with the W.Cl. 4 form and a certified copy of the injured employee's ID document to

the Compensation Commissioner by fax to (012) 3244734 or post by registered post to The Compensation Commissioner to P.O. Box 955 Pretoria 0001 within 7 days of the incident occurring.

(Where the *First Medical Report* (W.CL.4) was not sent together with the employer's report of an occupational injury, it must have submitted to the Commissioner as soon as it is obtained.)

Step 3:

The Compensation Commissioner will send the employer a postcard (W.Cl.55), providing a claim number (reference number) which must be used on all correspondence relating to this matter.

Step 4:

Once the Compensation Commissioner has considered the claim and only when ***liability is accepted*** for payment of all medical expenses etc., will a postcard (W.Cl.56) be sent to the employer. Where a W.Cl.56 is not issued, it means that the Compensation Commissioner does not accept liability for any payment.

Step 5:

In cases of prolonged absence, a *Progress Medical Report* (W.Cl.5) form must be obtained **monthly** from the Doctor and submitted to the Commissioner as soon as it is obtained.

Step 6:

Once the Doctor handling the case is satisfied that the employee is fit for duty, the Doctor will issue a *Final Medical Report* (W.Cl.5), which must be sent to the Compensation Commissioner.

Please note that the *Progress Report* and *Final Report* are on the same form (W.Cl.5).

Step 7:

When the employee resumes work, a *Resumption Report* (W.Cl.6) must be completed and submitted to the Commissioner.

Only after every one of these forms has been submitted will the Compensation Commissioner make all of the payments and close the case.

Most problems that occur with the Compensation Fund is that the Employer does not send through the *Progress, Final and Resumption Reports*, therefore the Employer does not get the money from the Compensation Fund that was paid to the injured employee and the Doctors do not get paid.

PAYMENTS FOR INJURY ON DUTY

If an employee is injured on duty and is sent to the doctor/hospital, one of the following three payment criteria comes into operation:

1. If the employee is booked off due to an IOD for 3 days or less, the Compensation Fund **does not pay a cent.** Therefore, the employer does not need to pay the injured employee any payment.

2. If the employee is booked off due to an IOD for 4 days or longer, but less than 3 months, the employer pays the injured employee at **a rate of 75% of basic wages** only, from day 1 until the employee returns to work.

3. If the employee is booked off due to an IOD for longer than 3 months, the employer pays the injured employee at a rate of **75% of basic wages**, from day 1 for 3 months and **nothing thereafter**. Once the 3-month period expires, the injured employee must claim his money from the Compensation Fund himself.

4. It is important to remember that if the employer pays their employees in full for the IOD, the long term cost to the company should be taken into consideration as it has been proved in practice, that where companies only pay as per regulations, their IOD rate is drastically reduced.

If you are unsure whether an incident is an IOD, submit your forms to the Commissioner and let them decide. The COID Act works on the proviso of "at the discretion of the Compensation Commissioner".

Group Activity

The Case

On Friday, 10 May, Johannes Majolo, General Worker on your farm was trimming bushes with a chain saw. Peter Mokaba was working with him when the accident occurred.

Peter is a trained first aid worker and he immediately applied the necessary action to prevent further blood loss and shock. Johannes was rushed to the Clocolan Hospital where Dr Botha treated his wounds, but his fingers could not be saved.

Johannes was hospitalized from 10 May 2007 to 15 May 2007 (date of discharge). He was booked of from work for the period up to 31 July 2007 – to give the hand an opportunity to heal.

He was trained by SAWDUST Training comp to operate the chain saw and received a certificate to this extent on 12 January 2006.

He has been employed since 1 February 2003 and lives on the farm. His earns a monthly salary of R1 200-00 and is permanently employed. He is not married and lives on his own.

Johannes will not be able to work with electrical tools as a result of the accident. He is however able to continue with his other duties.

He has resumed duty on 1 August 2007. You have paid his full remuneration for the period of his illness.

He has requested you to assist him to submit a claim to the Compensations Commissioner.

In your small groups:

- Complete all the required forms on the IOD of Johannes:
    - WCL 2
    - WCL 6
    - WCL 3 –on behalf of Johannes
- Also list the other applicable forms that should be completed by the medical personnel

CHAPTER 4

CONTROL INPUTS AND STOCK IN AGRIBUSINESS

In this chapter we explore the following concepts:

- Cleaning and disinfecting stores and stored items
- Arranging stock in a store
- Storage and separation
- Stock planning and record keeping
- Inventory control
- Stock levels
- Counting and recording stock issued on a record sheet
- The basic rules and regulations regarding handling and storage of inputs
- Safety regulations
- Occupational Health and Safety Act
- Labelling stock appropriately
- Appropriate storage methods for various products.

PLANNING AND PROCEDURES TO RECEIVE INPUTS INTO A STORE

CLEANING AND DISINFECTING STORES AND STORED ITEMS

Cleaning

The first step in cleaning an area is to dry clean. Dry cleaning refers to the removal of all dust and dry "dirt" from the area. Where pesticide spills are evident, these need to be correctly cleaned up and removed to designated pesticide waste sites.

Dry-clean and remove all equipment and removable objects. Where possible, one can use compressed air to remove surface dust from all internal structures. All dry residues should be removed and disposed of.

The areas where animal foodstuffs are stored must be cleaned with detergents and followed by microbial control agents. At first, all surfaces should be washed with a suitable detergent. (Remember, detergents must be diluted as per label). Allow extra time for the detergent to dissolve dogged dirt on the surfaces. Apply the detergent with a spray pump at low pressure. (Clean from the inside top of the roof and work downwards).

Adjust the spray pump to a higher pressure and rinse the detergent with clean water, starting from top working downwards.

Disinfect the whole area after washing. Check all rodent bait stations, and refill with the specified rodenticides as necessary.

Types of microbial control agents

Microbial control agents are divided into major groups. The Definitions are based on how and what the compounds control. The basic Definitions are set out below:

- Antiseptics inhibit or prevent the growth of microbes on living tissue.
- Disinfectants inhibit or prevent the growth of microbes on inanimate objects.
- Sanitizers reduce the number of microbes to a safe level.
- Sterilizers eliminate all microbes.
- Bactericides control bacteria.
- Fungicides control fungi.
- Viricides control virus
- Sporicides control fungal and bacterial spores.
- Biocides kill living organisms.
- Detergents contain free ions and leave a thin film on surfaces.
- Anionic Detergents (soaps) have free negative ions that produce curd when combined with calcium and magnesium in hard water.

- Cationic Detergents Quaternary ammonium contains positively charged ions, which remain suspended in solution.

Disinfectants for the control of micro-organisms are used in the food and drink industry primarily, on farms where produce is processed and in other processing facilities.

Disinfectant suppliers use the material safety data sheet to set out the hazardous properties of their products. The MSDS provides information about the health hazards, physical and disinfectant characteristics, first aid, and how to use the disinfectant safely. Once this information is available, add to this the producer's warnings, it is user's onus to read the information on the label before using a disinfectant. This will ensure that the product is used correctly and also that the proper health precautions are taken.

The section below sets out some properties of commonly used disinfectants. The compounds are classified here according to disinfectant classification. Please note that this is not done to confuse the reader, but rather to ensure that the end user of these compounds will be able to identify the hazards of the cleaning products they commonly work with.

Hypo-chlorites are chlorine disinfectants	▪ Prevent a wide range of germicidal activity. ▪ It has limited activity when in the presence of organic matter. ▪ It has a poor residual activity and is corrosive. ▪ It is fairly effective as Sporicides. ▪ It is effective at low concentrations as disinfectants. ▪ Relatively cheap ▪ It requires frequent applications.
Iodine Disinfectants (contain iodine / iodine based)	▪ Prevent a wide range of germicidal activity. ▪ It has limited activity when in the presence of organic matter. ▪ Poor residual activity, corrosive, stains fabric and equipment. ▪ It is fairly effective as Sporicides but better than chlorine. ▪ It is effective at low concentrations as disinfectant. ▪ Relatively cheap ▪ It requires frequent applications.
Chlorhexidine	▪ Prevent a wide range of germicidal activity, but ineffective against some important ones. ▪ Affectivity limited in the presence of organic matter. ▪ Limited residual activity and must make contact for at least five minutes. ▪ It is fairly effective as Sporicides. ▪ It is effective at low concentrations as disinfectant.

	▪ Relatively cheap ▪ It requires frequent applications. ▪ It is non-toxic.
Alcohols	▪ Prevent a wide range of germicidal activity and non-corrosive ▪ It has a fire hazard and irritating to tissues. ▪ Limited activity in the presence of organic matter ▪ It has s limited residual activity. ▪ Not effective as Sporicides. ▪ Effective disinfectant at 70-95% alcohol concentration

Oxidizing Agents

Oxidizing Agents	• Peroxides such as hydrogen peroxide • Moderate too wide effective against germicidal activity • It is moderate corrosive and limited toxicity. • Affectivity zero in the presence of organic matter. • It has a poor residual activity. • Not effective as Sporicide.
Phenolic Disinfectants	• Effective against a wide germicidal range • It is relatively non-corrosive with limited toxicity. • It is very effective in the presence of organic matter. • Has a poor residual activity. • Not effective as Sporicide.
Quaternary Ammonium Compounds	• Effective against a wide germicidal range • It is non-corrosive and low toxicity. • Has a reduced efficiency in the presence of organic matter? • Not effective as Sporicide. • It is a good disinfectant when used on cleaned surfaces and cheap.

Aldehydes	• Effective against a wide germicidal range • Effective as a Sporicide and fungicide • Moderately toxic and poses human health risk. • It is not very effective in the presence of organic matter. • Has a slight residual activity.

Toxicity of disinfectants used on farm

The toxicity of a disinfectant is identified according to the amount of the compound that a person has to ingest to induce a negative effect. In the worst case scenario, the effect would be death. The word "hazard" refers to the ability of a pesticide to cause harm. The main hazards associated with pesticides are the toxicity and flammability. The word "risk" refers to the possibility that a person handling the product according to the manufacturers' directions will encounter the hazard accidentally. The directions referred to includes storage, transport and use. The risk is due to either a single or repeated exposure to the pesticide over a short period. "Safety" refers to the degree of freedom from risk. Safety precautions on labels are intended to reduce risks to acceptable levels.

There are three key words normally used to identify the toxic properties of a disinfectant. These are:

- CAUTION refers to disinfectant's toxicity when approximately 30 - 500 g could be fatal or harmful if taken in by an average man weighing 80 kg.
- WARNING refers to disinfectant's toxicity when 5 to 30g is taken in would cause death to an adult (80 kg) man.
- DANGER refers to a disinfectant's toxicity when 5 g or less taken in could cause death to an average adult (80 kg) man.

This information should make one consider what the possible effect of disinfectants could be on your health. These warnings posted on labels only take in account the acute effects (i.e. where death is induced) but do not consider the potential long term effects such as cancer, reproductive effects or even malformations.

Some common ingredients of commercial household products and their hazards are given below.

Chemical	Potential Health Effects
Ammonia	Fatal when swallowed
Ammonium Hydroxide	Corrosive, irritant
Bleach	Fatal when swallowed
Chlorine, such as used in disinfectants	Number one cause of poisoning in children
Formaldehyde	Highly toxic; known carcinogen
Hydrochloric acid	Corrosive, eye and skin irritant
Hydrochloric bleach	Eye, skin and respiratory tract irritant
Nitrobenzene	Causes skin discoloration, shallow breathing, vomiting, and death
Petroleum Distillates such as paraffin, turpentine etc.	Highly flammable; suspected carcinogen
Phenol	Extremely dangerous; suspected carcinogen; fatal if taken internally
Propylene Glycol (anti-freeze)	Affects the immune system
Sodium hypochlorite	Potentially fatal
Trichloroethane	Damages liver and kidneys

It is important that one is prepared for the use of any chemical, and that the proper safety and protective wear is used. Never eat, drink or smoke whilst using chemicals including cleaning agents.

Always treat disinfectants as if they are pesticides. Locate, identify, and label poisonous products within your home and work environment clearly, warning everybody that these are dangerous chemicals.

Protecting disinfectant users against poisoning

Exposure prevention

- Avoid exposure to all disinfectants. Never allow any disinfectants to come in contact with unprotected skin.
- Always wear protective clothing such as coats, gowns, aprons, gloves, and eyewear or face shields.
- Prevent inhalation of vapours when working in chemical fume hoods or unventilated areas.
- Ensure that all visitors also wear eye protection and other appropriate personal protection equipment (PPE).
- Access to the chemical storage facilities must be restricted so that only authorised personnel may enter.
- Signs identifying hazardous chemicals must be introduced where ever required.
- Never eat, drink, smoke, handle contact lenses, apply cosmetics, or handle foodstuffs while working with disinfectants.
- Never measure off a disinfectant by sucking on a siphon pipe.
- Always wear a respirator while using disinfectants (formulated product or diluted compound).
- Ensure you wear specialised gloves and protective clothing if you work with acids.
- Limit the stock of disinfectants that poses highly hazardous to the minimum quantities required.
- Keep flammable disinfectants in a flammable storage cabinet.
- Never leave disinfectants on the floor where you are working.
- Keep a disinfectant inventory

- Outdated and obsolete disinfectants must be disposed of following a disinfectant waste disposal program
- Ensure that you know how to handle spill control kits
- Clean spills promptly and decontaminate the areas.
- Always place disinfectant wastes in appropriate and properly labeled containers for disposal.

All disinfectants must be considered as potentially poisonous and handled accordingly. The minimum requirements for safe handling are usually stipulated on the disinfectant's label.

In the case of most disinfectants it is sufficient to follow a few basic rules as summarized below:

- Always wear rubber gloves when pouring or measuring a concentrate. Ensure that it is done in such a manner that any fumes or dust will drift away from the applicator (ventilation).
- Immediately wash off any spillage on the body with soap and plenty of water.
- Wear an overall (or other old clothing) that will cover most of the body.
- Wash clothes regularly, especially when applying a disinfectant over an extended period of time. Wear a fresh set every day.
- Always keep out of the spray drift or dust cloud during application.
- Never smoke, eat or drink during application. Wash your hands and face before doing so.
- Take a bath after completing the application and change into clean clothes. Never continue with another job while still wearing clothes contaminated by a disinfectant.

In the case of highly poisonous disinfectants, additional precautionary steps must take be taken. Special protective clothing, rubber gloves and boots, headgear, goggles and a mask or respirator must be worn. The eyes and respiratory tract must be adequately protected.

It is a good measure to wear a respirator during the use of any disinfectant. Ensure that the respirator is fitted with a suitable cartridge.

Protective clothing

Eye protection

A number of different types of protective eye guards are available. They range from standard clear lenses to UV protective lenses. When wearing eyeglasses ensure that they fit the activity you need it for. There are 6 main classes of protective eye guards.

- Safety Spectacles with side-shields
- Goggles with a rigid body and padded
- Goggles with a flexible fit and regular ventilation window
- Face Shield (plastic window)
- Goggles with a flexible fit and hooded ventilation
- Chipping Goggles (eye cup type)

The table below indicates which types of eye shields should be used for the different activities.

HAZARD	EYE SHIELD
IMPACT from flying objects, fragments and particles	1,2,3,4,5,6
HEAT and hot sparks	1,2,3,4,5,6
HEAT only high temperature	5
CHEMICAL splash	3,4,5
CHEMICAL mists and fog	4
DUSTS	3,4,6

Chemical Splash shields are required when using:

- Concentrated acids or bases.

- Corrosive gases.
- Potentially explosive or water reactive chemicals.
- Acutely toxic chemicals (liquid or powder).
- If 25 ml or more of hazardous liquid chemicals are used.

Gloves

The correct gloves should be worn (depending on the chemical with which you are working). Gloves should be selected based on the chemical resistance of the material that it is manufactured from. The table below indicates the chemical resistance of different materials.

MATERIAL	CHEMICAL RESISTANCE
Natural Rubber	acids, alkaline, salts & ketones
Neoprene	chlorinated solvents, alcohol, alkaline & petroleum products
Nitrile (generally better than natural rubber and neoprene)	chlorinated solvents, alcohol, alkaline & petroleum products
Butyl Rubber (best for gasses)	acids, ketones & esters
Viton (best for solvents)	solvents, PCB & aniline
Polyvinyl Chloride	acids, alkalis, fats & alcohols

Clothing

The purpose of protective clothing is to prevent contamination of the skin and to prevent contaminants leaving the working area. Coats and aprons should be worn for light protection, as these will not cover the whole body. Specialized protective clothing must be worn when necessary. Use cover alls when applying a chemical with a sprayer. When using a fogger or ULV type applicator, you must wear a disposable over-all with the correct grading subscribed for a specific activity.

Respiratory protection

Respiratory protection is essential when mixing a solvent and dilutions. If you apply a pesticide or hazardous disinfectants, wear respiratory protection and not a facemask. Facemasks (dust masks) only prevent dust from entering the respiratory canals. If you work with toxic and hazardous chemicals you should wear a respirator fitted with a good cartridge. In general, the best cartridges to fit are the agricultural grade cartridges.

DISINFECTANT APPLICATION

There are several ways to apply disinfectants. The most frequently systems used are:

Clean-in-place systems

Clean-in-place systems are used for internal disinfections of a plant or equipment. The disinfectant is generally sprayed on equipment using a standard spraying knapsack applicator or a hand pump. The disinfectant is diluted with water (check the label for the correct dosage) and the area to be disinfected is simply sprayed. In most cases the area is sprayed to the point of run-off (wet). It may however be necessary to apply a specific dosage rate per unit area. In such cases ensure that the equipment is calibrated.

Knapsack sprayers consist of a tank with a capacity of up to 20 l.

The tank forms the main body of the sprayer and is usually carried on the back. Inside the tank is a cylinder with an open-and-shut valve causing the building up of pressure once the handle on the side is maneuvered up-and-down. Pressing the trigger on the application system allows the contents (under pressure) to escape the tank through nozzles at the tip of the system. These nozzles can be adjusted to suite your application requirements.

Mist spraying

Mist spraying indicates the application of a disinfectant in a form of small droplets. Mist applicators change the disinfectant solution into an aerosol which is dispersed throughout the area being treated. Usually the solution is applied as Ultra Low Volume; similar to that in ULV pesticide applicators, and therefore the solution being applied is highly concentrated. Suitable personal protective equipment such as boots, overalls, gloves and respiratory protective equipment must be worn. Ensure that the respirators are fitted with the correct filter types. It is imperative that operators take the necessary preventative health steps.

Fogging

Fogging produces smaller droplets than mist sprayers. Typically, foggers will create a "fog" of highly concentrated disinfectant solution. Because of the small droplets being created the residue time of the solution is normally longer than in the case of misters and sprayers, therefore the prohibiting time for entering that area should be strictly adhered to.

There are two main types of foggers that are generally used, namely cold or thermal foggers. Cold fogger units produce a cleaner fog or mist than other applicators, and can be used either indoors or outdoors. These applicators can dispense both water or oil based chemical formulations.

Thermal foggers are powered by electricity or gas driven to generate heat that turn the chemical into fog. This fog fills the whole room, meaning that it come into contact with all surfaces, top to bottom.

Manual disinfections and mopping

Manual disinfections and mopping is probably the simplest way to apply disinfectants. In this system a cloth, brush or mop is used to apply the disinfectant solution from a bucket. This is normally the most time consuming system and not always effective as it may be difficult to get the solution into small crevices and corners. It is however more effective applied after an area was thoroughly cleaned. It is possible to apply disinfectant whilst cleaning and area. It is wise to wear an impermeable apron, overalls, gloves/gauntlets and safety spectacles/visor. Wear respiratory protection when working in enclosed spaces.

Although the application of a disinfectant is more relevant to storage and packing facilities, know becomes relevant to the farming system especially where crops are produced in greenhouses and tunnels as they require regular disinfecting between cropping periods. It is also critical that disinfectant trays are placed at the entrances of the facilities. The idea is that one walks through the tray containing a disinfectant (usually a chlorine based solution) before entering the greenhouse/tunnel to prevent micro-organisms from entering the facility and possibly attacking the crop.

CLASSIFICATION OF STOCK

Everything you use to make a product, provide a service or to run a business is part of your stock.

There are four main types of stock:

- raw materials and components - ready to use in production
- work in progress - stocks of unfinished goods
- finished goods ready for sale
- consumables - fuel and stationery

The type of stock can influence the quantity you should keep (see the page in this guide that determines the quantity of stock you should keep).

The resources that are used in farm production (chemicals, tools, implements, feed and seed) are collectively called agricultural inputs. Most farm inputs are purchased from a co-op or shop. The volumes of inputs purchased are normally high and it has to be stored on the farm before being used. The equipment is normally expensive and require storage (when not in use) to ensure that they last for a prolonged period of time.

STORAGE OF AGROCHEMICALS

Agrochemicals include pesticides, disinfectants, additives, stock remedies and fertilizers. These should be kept in a protected store on the farm. Within the store one should separate the different types of agro-chemicals, keeping similar chemicals together, (the pesticides should be kept separate from the fertilizers, herbicides should be separate from insecticides) to ensure there are not confusing. When pesticides are packed in a store on shelves, powder or dry pesticide formulations should be stored on the top shelves, above the liquid formulations. Seeds and feeds should never be kept in the same store as agro-chemicals.

ARRANGING STOCK IN A STORE

Chemicals should be stored under dry, good ventilated and cool conditions to prevent rapid deterioration. The store should be well organised with the shelves labeled and areas designated for specific materials or equipment. Chemicals should be well separated from other items, preferably in a separate store.

A list of the contents in the store must be kept. In addition, when stored items are used, it should be logged and maintenance records kept for equipment. This will allow you to replace items in good time and ensure that equipment is kept in an optimal working condition. A well-organised store will prevent the accidentally wrong usage of items.

Water tends to condense on cement floors. In order to prevent wetting and damage to cartons or paper bags, or even rusting of metal containers, materials should be placed on pallets and should not be stacked against exterior walls.

CORRECT AND EFFICIENT STORAGE

It is important to store/stack items correctly as it will prevent accidents and injuries from occurring, prevent contamination and the spreading of bacteria, improve the daily work routine, stock taking is made easier, inventory control & ordering is made easier and maintenance is completed more efficiently.

A few pointers that will help you when storing equipment and materials correctly:

- Hooks and clips can be used to hang up items such as brooms & mops.
- Storerooms must be lockable.
- There must be good ventilation.
- Sufficient light must be present.
- Chemicals must be labeled & stored away from other materials.
- Chemicals must NEVER be kept in unused food or drink containers.
- Chemicals must be stored away from direct sunlight or heat.
- Chemical containers (with taps) should have a tray/bucket to collect spillages and drops that may cause accidents.
- Diluted chemicals must be marked or labeled to ease identification.
- Do not allow waste to accumulate in storeroom but must be disposed of in a prescribed manner.
- Chemicals (by law) are not allowed to be stored on the floor. Pallets and shelves should solve this problem.
- Use a ladder when reaching for items on top shelves.
- Clean shelves and floors regularly.
- Always store items in the correct place as specified by organisational procedures.

- Only authorised staff should have access to the storeroom.
- Keys to the storeroom should be kept by the person responsible for the storeroom, such as the supervisor or store man. Every item leaving the store should be signed in and out according to procedures.
- Everything that concerns stocks and supplies should be recorded in order that the person, responsible for the store, can keep track of stock levels and ease stock taking.

VENTILATION

Well-designed and well-maintained ventilation systems remove corrosive vapours, fumes, mists or airborne dusts from the work area and reduce their hazards.

The quantity and type of ventilation needed to minimize the hazards of airborne corrosives and volatiles depends on the kind and volume of chemicals stored and the size and layout of the work area.

An evaluation of the specific way in which such chemicals are stored, handled, used, and disposed of should be done to be able to determine whether existing ventilation measures (and other hazard control methods) are adequate.

Some workplaces may need a complete system of hoods and ducts to provide acceptable ventilation. Others may require a single, well-placed exhaust fan. When working with a small quantity of chemicals, a specially designed ventilation system will not be necessary. Use a corrosion-resistant construction when acidic chemicals are stored.

PREVENTION OF CONTAMINATION

Use products on the basis of "first in first out".

If chemicals and fertilisers are kept in the store for a long time, they might become ineffective or they might even become dangerous due to the chemical reactions that take place over time.

USE, HANDLING AND STORAGE OF TOOLS

Five simple basic steps to ensure a more organized tool storage area:

Step 1: Clear out the junk

Throw away all the junk and broken tools as they take up space. Sort out the rest and place it in cabinets, on shelves or hang it on hooks (type to type).

A disorganized place is transformed into a neat and tidy store!

Step 2: Paint the walls and floor

Consider painting the floor and walls before you start installing and arranging your storage systems. Preferably use an epoxy paint that is designed for floors and use lighter colours in smaller spaces to make them appear bigger.

Step 3: Storing smaller and larger items

Many storerooms have untapped potential that can be utilised to make room for more storage. Shelving is vital. Inexpensive shelves can be purchased from the co-op or more expensive custom-designed cabinets can be installed.

Always label closed containers so that you know what is inside.

Allocate space for the different types of hand tools on the shelf. Spare parts (for other equipment such as tractors, spray pumps, mowers and weed trimmers) should be stored on a separate shelf.

Step 4: Organise your work area

Use transparent jars to store smaller items (screws, nails and washers) so that you can easily see what they contain.

Step 5: Safe storage for expensive tools

Install a lockable latch on a cupboard door to lock expensive electrical tools away.

- Extra storage in the roof must also be considered.

  Attach a storage shelf onto pulleys hanging from the beams to hide boxes or crates that may be needed at a later stage.

- Lights

  Mount spotlights on the beams above the working area to ensure that the area has adequate light. (A standard light is likely to cast shadows over the working area).

KEEP ACCURATE RECORDS AND HANDLE STOCK

STORAGE AND SEPARATION

The various different inputs should be separated within a store. Depending on the actual commodity being stored, the systems used in different stores may differ. In the case of pesticides, it is useful to separate the herbicides, fungicide and insecticides by placing them in different designated areas within the store. This will ensure that an herbicide is not accidentally taken instead of an insecticide. When stacking pesticides, the powder and granular formulation should always be stored away from the liquid formulations.

When shelves are used, the dry formulations should be kept on the upper shelves and liquids on the lower shelves. This ensures that should a liquid container leak, it will not contaminate the dry products. When stacking containers, there are a number of rules to be followed. These rules are set out in the table below.

Container type	Number of layers allowed on a base plate	Number of packages allowed on a pallet
Steel drums = 200 l	1	3-4
Steel drums < 200 l	2	3-4
Fibre drums = 200 l	1	3
Fibre drums < 200 l	2	3
Plastics drums = 200 l	1	2
Plastics drums , 200 l	2	2
Paper bags	4-5	3
Plastics bags	4-5	3
Fibre case containing tins	4-6	3-4
Fibre case containing soft packages	4-6	2
Wooden cases	2-4	3-4

Generally, a rule for storage systems should be flexible and adaptable.

- **Stacking position and heights**

Stock should be arranged in such a way that the "old" stock is used first ("first in - first out" principle) to prevent obsolete stock from accumulating. Containers should be arranged to minimise handling and thus avoid mechanical damage giving rise to leaks. Floor spaces should be neatly marked and with (1-m wide) passages between shelves or stacks that permit easy inspection, allow free airflow and also enables immediate clean-up in the event of any leakage or spills which can be easily seen. Climbing on pesticide containers should not be permitted as damaged or corroded metal drums can easily give way under a person's weight.

Containers should not be placed directly on the floor but rather onto pallets and the total pallet height should not exceed 107 cm. This will allow the identification of leaking or corroding containers. Dry formulations should be kept in boxes to avoid caking. When chemicals are packed in glass containers it should also be kept in boxes to prevent breakages.

Pesticide ordering and shelf-life

The shelf-life and rate of use must be taken into account when ordering inputs. Do not order more than one year's requirement. The date of manufacture and shelf-life should be visible on the outside of the container. If a larger quantity is ordered than can be used during the period of shelf-life, outdated stocks will accumulate and present disposal problems.

Stock inspection and shelf-life

Stocks in a store should be inspected regularly for signs of deterioration, such as caking of powders, sedimentation or clotting of liquids and discoloration through oxidation. Shelf-life declines rapidly after containers have been opened and left partially empty. Stock turnover must be organised to ensure that the contents of a container are used as quickly as possible once the container has been opened. Unsealed powder and wettable powder containers should not be kept for more than one year.

Containers are not only subject to deterioration caused by external factors (climatic, biological and mechanical), but can also be corroded internally through the action of the pesticides they contain. Emulsion concentrate formulations are particularly likely to affect weak spots, especially along seams or where there are imperfections on the internal coating of the container. Some pesticides increase in acidity during storage and this makes them

more likely to corrode containers from within. Discoloration of a pesticide is a sign of corrosion and should be looked for during stock inspections.

STOCK PLANNING AND RECORD KEEPING

A proper system for planning stock is essential. Records should be kept when stocks are received or issued as it reflects the stock on hand and will prevent shortages of specific inputs as it can be ordered immediately. It also secures the "first in - first out" basis.

This is especially important for pesticides and fertilisers that have a limited shelf-life as this will prevent accumulation of obsolete stocks. Major problems may develop where inputs are not tracked. A system is thus required to track agricultural inputs in the store.

Recording systems

Record keeping systems are designed to record the movement of inputs in and out of the stores. The system used will differ from farm to farm and will adjust according to the size of the store. The records should ideally be kept separately from the store.

Small stores

In the case of small stores, detailed records may not be required. A person farming on a small scale will only use limited quantities of pesticides etc. Even though this may be true the small-scale farmer should also adhere to basic store practices.

The minimum information to be recorded should be the date of purchase or arrival, the name and type of pesticide, batch numbers and volumes. The system may be as simple as writing the information directly on the container.

All containers must have proper labels that must remain attached to the containers, clean and legible at all times.

The small-scale farmer should keep all invoices, delivery notes or receipts obtained in connection with pesticide purchases separate from the store. This will enable the farmer to contact the pesticide supplier in the event of an emergency or if further advice is needed. The farmer should also have a supply of material safety data sheets, which the supplier or manufacturer can provide.

Large stores

Large stores will require some sort of formal recording system. The adapted system depends on circumstances. Records should be kept separate from the pesticide stock so that they are not destroyed in the event of a major disaster (such as fire, flood, earthquake, hurricane or destruction during civil unrest).

Records may be kept as sheets in a ledger or in card index form. Duplicate records adjacent to the stock itself may also be required, perhaps in simplified form. Again, a supply of material safety data sheets should be requested from the supplier or manufacturer.

Records should be accurate and sufficiently detailed to enable a replacement to take over responsibility with ease.

Pesticides have a limited shelf-life and stock batches bought at different times may vary in formulation and packaging. It is important to have a separate record allocated to each consignment as it is received from the store.

The national authority responsible for the procurement of pesticides needs to be updated regularly on stocks kept in various locations in the country. These figures can easily be obtained from records.

The figure below is an example of a record sheet for pesticides that are received on delivery at farm store (from FAO Field document GCP/INT/572/NET)

Sample pesticide store stock record sheet

Pesticide group ..... Insecticide OP Ref. no. ..... Inv 29:5[R3]
Common name ..... Chlorpyrifos
Trade name ..... Dursban
Formulation/concentration ..... % ec, 400 g/litre
Manufacturer/supplier ..... Dow Elanco, USA
Quantity (agreed issuing quantity/package) ..... 1 000 2.5-litre plastic containers
Primary packaging quantity ..... Four containers of 250 cartons
Date received ..... 20 December 1994
Use-by date ..... 1 December 1996
Notes (shelf-life; special storage conditions; inspection frequency) ..... Two-year shelf-life; keep cartons sealed; inspect every six months; look out for breakdown of plastic containers

Date	Quantity issued (litres)	Balance in stock (litres)	Notes (stock inspection notes on condition etc.; storekeeper's initials)
25 December 1994	650	1 650	
6 June 1995			Stock inspected; no damage. MRKL
10 June 1995	1 300	550	Stock check. MRKL
10 September 1995		548	Stock inspected – two containers leaking; disposed of. MRKL
30 September 1995	548	nil	

Record of disposal of outdated stock ..... Leak absorbed by sawdust and burnt, split containers relocated to store II and contents transferred

(MRKL are the storekeeper's initials)

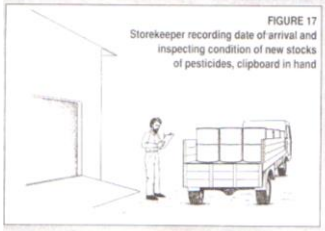


FIGURE 17
Storekeeper recording date of arrival and inspecting condition of new stocks of pesticides, clipboard in hand

Notes on the sample record sheet

Reference number. Cross-reference should be made to the invoice or delivery note; location of the pesticide in the store (bin, shelf or row number).

Identification of the pesticide. Pesticide group, common and trade names with details of formulation and concentration should all be recorded.

Source of the pesticide. Where possible information on primary manufacturer or formulator, as well as local source, should be recorded (with local telephone number where available in case of emergency). Where the pesticide came from should also be recorded since many stocks are shifted around.

Packaging and issuing units. These may differ; the pesticide may be in 200-litre metal drums or in 1-litre cans packed in boxes of 20 with sales or issues being made in units of the 1-litre can.

Date received. Possibly the most important item of information; it is essential that this should be documented. It must also be recorded on the actual pesticide containers together with the use-by date (Figure 17).

Notes. Information should be obtained from the supplier on shelf-life (use-by date), any special storage requirements, particular hazards and other details, which should be incorporated as instructions to the storekeeper on the record form.

Stock operation and management. Details of receipts and issues must be meticulously recorded and records of periodic stock inspections should be kept initialled by the inspector. Careful notes should be made on the state of containers and contents at the time of inspection.

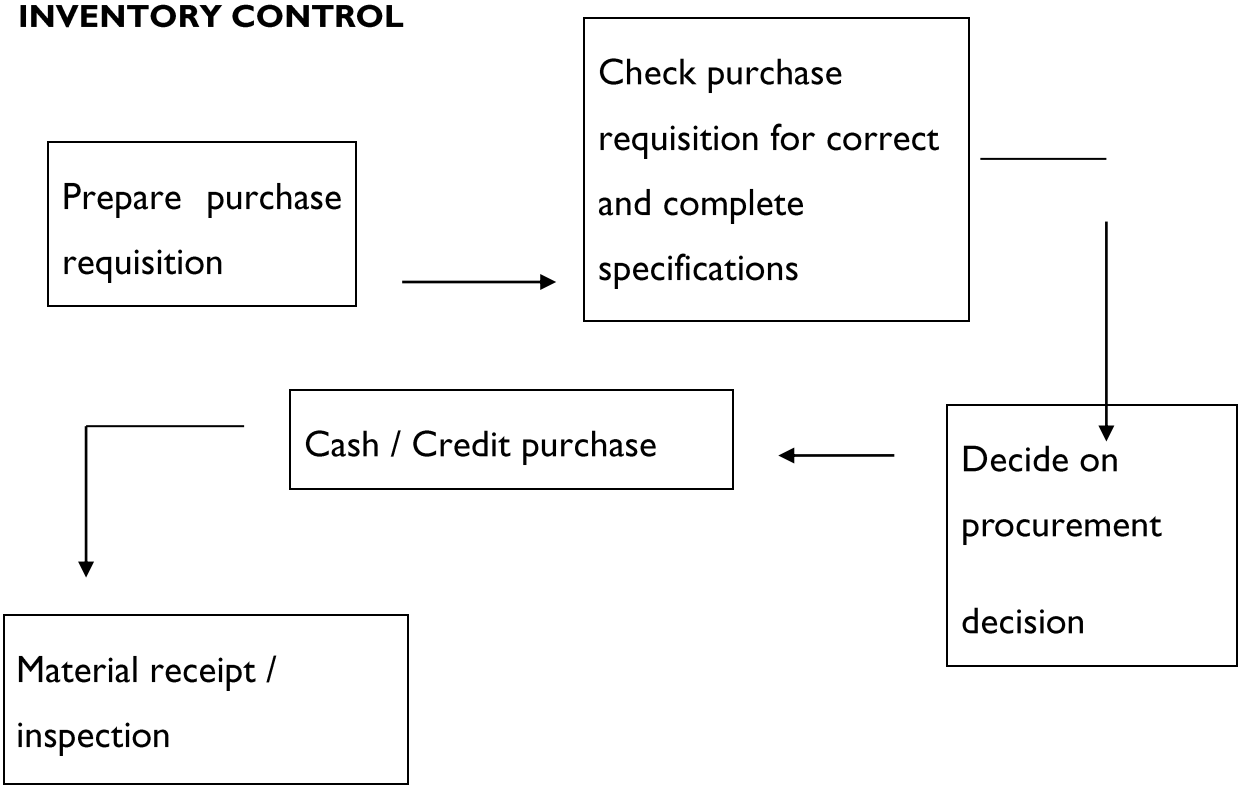
Disposal. When outdated stock is eventually disposed of it should be recorded, with notes on the method of disposal of the pesticide and its containers, the location of dumps, etc.

The following are typical procedures when receiving delivery of items:

Item	Procedures
Purchase agreements	Most organisations have standing purchase agreements with specific suppliers, generally due to the cost, safety, consistency and quality considerations. The purchasing manuals or agreements will give specifications for goods as well as agreed prices.
Orders	Be familiar with the orders that have been placed, the delivery dates and the possible time of delivery. This will help you to plan the receiving and checking of goods and to obtain copies of the relevant orders before deliveries arrive. Ensure that an authorised member of staff has signed the orders, received and checked the deliveries.
Delivery note/invoice	When receiving deliveries from preferred suppliers, it is important to check that the items delivered comply with specifications in the purchase agreement or manual. If the wrong items have been delivered, they should not be signed for. When deliveries arrive, ask for the delivery note/invoice/waybill and check that this matches your copy of the order regarding brands, items, sizes, quantities and other specifications. Check that delivery notes or invoices contain the relevant information including: Date, document number, quantity, description of goods, prices, name of the supplier, supplier's contact details, VAT rate (if applicable) and other matters such as delivery costs. It is essential to check the expiry or "use by" dates when perishable items such as animal feed and food tuffs are received. Do not accept any items that conceded the expiry dates. Check that items delivered comply with health and safety regulations and requirements, as specified by your organisation or in the purchasing manual. Tick off each item delivered against the delivery note to make sure that all listed items are unloaded from the delivery vehicle. Always check containers and packaging to ensure that items have not been damaged. Do not sign for damaged items.
Agricultural machinery and equipment and tools	Ensure that heavy machinery items are safely unloaded to avoid damage or injury. Heavy machinery and equipment should be unloaded in an area where it will not cause an obstruction to people or other traffic in the receiving area. Check that machinery/equipment complies with specifications of the order (make, brand, size, type, price etc.). Check that all the necessary attachments and tools have been included with the delivery. Machinery items are very expensive and should only be signed for if you are absolutely certain that you received exactly what was ordered. Machinery items should be safely transported to designated areas or storerooms as soon as possible.
Agro-chemicals	Check that deliveries comply with specifications and purchase orders.

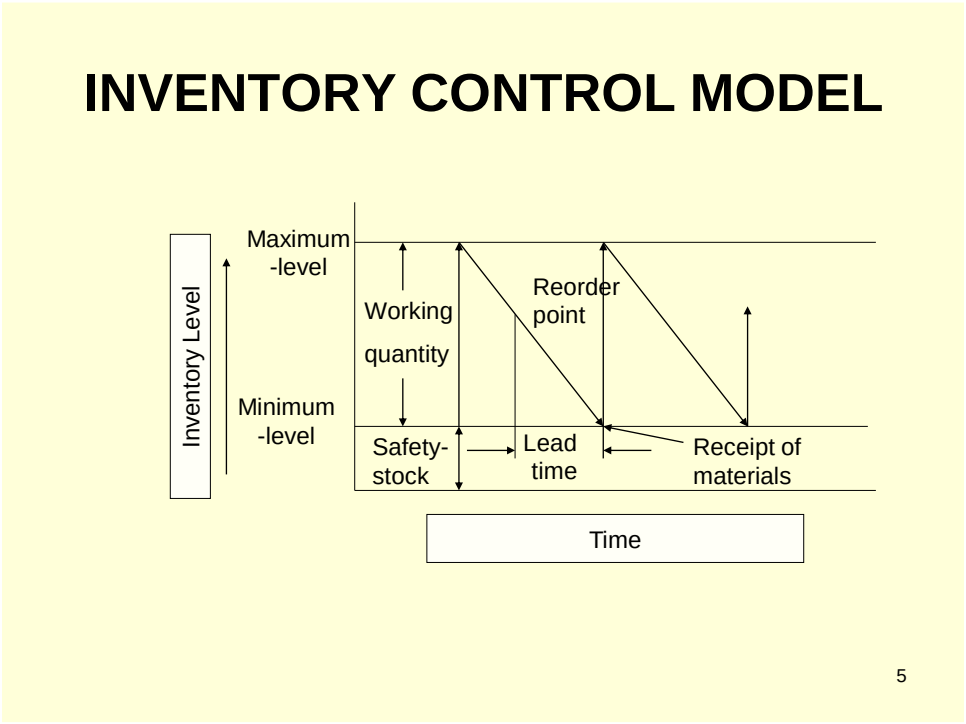
Item	Procedures
and fertilisers	Check the containers for leaks, breakages or other damage. Check that containers are clearly marked and correctly labelled according to contents. Check expiry dates on all cleaning and chemical products. If necessary, wear protective clothing when handling hazardous chemicals and cleaning agents. Cleaning agents should be quickly and safely moved to storage areas that are designated for this purpose.
Delivery discrepancies	Any damaged items need to be recorded on the delivery note or appropriate documentation and reported to your supervisor immediately. Any items that are short need to be recorded on the delivery note and a follow up done as to when they will be delivered or if a credit note is to be issued. This needs to be reported to your supervisor as well. Do not sign a delivery note unless you are sure that all deliveries are correct. Report to your supervisor or foreman if you are unsure.
Recording deliveries	Tick off all the items on the delivery note that were received correctly. Record incorrect items and follow procedures for reporting incorrect deliveries. All items need to be checked against the invoice for price irregularities. It is not usually your job to know the prices of the items as this will be checked by your team leader, supervisor, foreman or the accountant's office. However, if the item was priced at R1.00 and there were 10 of them, then you would need to ensure that the total was R10.00 and not anything different to this. Sign the delivery note when all items are correct and in good order. Always retain a copy of the signed delivery note for stock control and administration purposes. The delivery note/invoice/waybill must be given to the foreman or responsible person immediately. Items need to be moved to the storage areas as soon as possible to avoid losses or damage as well as to ensure that the receiving area is clear to prevent accidents occurring.

INVENTORY CONTROL



PURCHASE REQUISITION

COMPANY NAME				**PR No. _____**	
PURCHASE REQUISITION				**Date: _____**	
Requesting Department: _____					
Item #	**Qty**	**Ref #**	**Description**	**Purpose**	**Price / Unit**
Deliver to: _____				**Required date of delivery** _____	
Suggested Suppliers: _____ _____ _____				**Signed** **Approved**	



Types of material required

- Raw materials for producing the end product
- Spare parts for repair and maintenance
- Consumables for repairs and maintenance of machinery and also for support functions necessary to run the farm such as cleaning materials for up-keep of the buildings
- Uniforms and safety gadgets such as helmets, shoes and goggles etc for safety of persons

STOCK LEVELS

Stock levels must be kept as low as possible in order that the costs of holding them is minimised. At the same time stocks must not be allowed to run out. If they do run out production is halted. A number of factors influence stock levels:

- The nature of the product. For example, is the stock perishable? It is not practical to hold large amounts of stock that will go off very quickly.
- The facilities available. For example, the more warehouse space you have the more stock you can hold.

- Suppliers. For example, how often do they deliver and how reliable are they? If they deliver frequently and are reliable the farmer will not have to hold so many stock because they know they can rely on prompt delivery of more stock if needed.

- Stock holding costs. For example, if stock is expensive to hold due to special requirements such as having to be kept refrigerated or under security, then only a small quantity will be held.

- Lead time. This is the amount of time it takes for an order to be delivered and ready for use. If the lead time is fairly long the business will hold more stock so they can continue to operate while waiting for fresh deliveries to arrive.

- Stock pile. Farmers may build up stock to deal with seasonal demand.

Minimum stock levels

It is the level below which the inventory is not allowed to fall.

Maximum stock levels

It is the inventory level beyond which the stock level is not allowed to exceed.

Safety stock

It is the level of inventory which is to be maintained always to take care of unforeseen factors.

Re-order point

It is an important tool for controlling inventory and to ensure that there is no stock out.

Re-order level

- Crossing the maximum level means over stocking
- When the inventory level goes below the minimum level, it could result in stock out
- A re-order point is set between these two set points, i.e. the maximum and minimum level of inventory
- Order for material is placed when the re-order point is reached

- The re-order point is set in such a manner that ordered material is received before the stock level reach the minimum stock level
- An order is placed for the working quantity of the material
- On receipt of material, the stock level of inventory jumps to the maximum level

REMEMBER!!

For good stock control, it is advisable to have separate books, ledger sections or stock cards for each type of vaccine. If a book is used to record vaccine, label each section of a ledger clearly with the vaccine type. Enter each delivery of each vaccine in the record system as it is received. If stock cards are used, open a new card for each new delivery and record only one vaccine batch or lot on each card.

If a consignment of vaccine is received in dry ice, the shipment should always arrive with the correct quantity of diluents for reinstituting the vaccine when it reaches the user. For such shipments, the following details must also be checked and recorded for the accompanying diluents:

- The type of diluents (i.e., for use with which type of vaccine)
- The quantity received (in doses)
- The diluents manufacturer
- The expiry date(s)

COUNTING AND RECORDING STOCK ISSUED AND RECEIVED ON A RECORD SHEET

The figure below is an example of a stock record for vaccines and diluents used for an animal farm. The record clearly indicates the store's name and location, the batch number, the expiry date and the quantity received and issued. This record shows the volumes that remain and this enables the storekeeper to determine when to re-order stock. These records also act as a record for volumes used over time.

Example of a stock record sheet or card for vaccine and diluents for animals:

VACCINE STOCK RECORD

Store Name: _____ Vaccine: _____ Vial Size: _____

Region: _____ Province: _____ District: _____

Date	From: Manufacturer/ Supplier	To: Store/ Health Unit	Batch Number	Expiry Date	VVM Status	Vaccine Quantities Received (doses)	Issued (doses)	Balance (doses)	Remarks
-	-	-	Vaccine carried forward from previous sheet:-						
-	-	-	Diluent carried forward from previous sheet:-						
	(vaccine)								
	(diluent)								
	(vaccine)								
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					Totals (vaccine):				
					Totals (diluent):				
							Physical Stock Check (vaccine):		
							Physical Stock Check (diluent):		
							Carried Forward (vaccine):		
							Carried Forward (diluent):		

IDENTIFY LEGISLATION REGARDING DIFFERENT INPUTS

THE BASIC RULES AND REGULATIONS REGARDING HANDLING AND STORAGE OF INPUTS

When should I wear proper personal protective equipment?

If other methods, such as engineering controls, are not available or effective enough to control exposure to corrosives, wear suitable personal protective equipment (PPE). Choosing the correct PPE to wear when doing a particular job is essential therefore it is best done with the help of someone who knows how to evaluate the hazards of the job and how to select the proper PPE. MSDSs should provide general guidance.

Avoid Skin Contact

Wear protective gloves, aprons, boots, hoods, or other clothing depending on how big a chance there is of skin contact. This clothing must be made of materials that resist penetration or damage by the chemical. Normally the MSDS formulate recommendations regarding appropriate materials, otherwise contact the chemical's manufacturer or supplier for specific information.

Protect Your Eyes and Face

Always wear eye protection when working with corrosives. Although ordinary safety glasses provide some protection, chemical safety goggles are best. In some instances you should also wear a face shield to protect your face from splashes. The current Canadian Standards Association (CSA) Standard Z94.3, "Industrial Eye and Face Protectors," provides advice on selection and use of eye and face protectors.

Avoid Breathing Corrosive Vapours, Fumes, Dusts or Mists

A written respiratory protection program should be followed when using respirators for breathing protection.

Where should corrosives be stored?

In general, stack different types of chemicals and fertilisers separately, away from processing and handling areas, and away from other materials. Separate storage can reduce the amount of damage caused in case of fires, spills or leaks. If totally separate storage is not possible, store corrosives away from incompatible materials.

Some corrosives are incompatible to each other (e.g. the reaction of acids and bases can be fatal) and should not be stored next to each other.

In storage areas where corrosive items are kept the walls, floors and shelving should be made from materials that resist damage by corrosives. Floors must be treated to prevent liquids from penetrating (in the case of liquid corrosives). Since many corrosive liquids flow easily, it is advisable to store the containers in corrosion-resistant trays to restrain spills or leaks. For large containers, such as 250-litre (55-gallon) drums, it will be necessary to build embankments around the storage area.

Store containers at a convenient height for handling, below eye level if possible. High shelving increases the risk of dropping containers as well as the severity of damage if a fall occurs.

- Store corrosives in areas which are:
    - well ventilated.
    - supplied with adequate fire-fighting equipment.
    - supplied with suitable cleaning equipment and materials in case of spillage.
    - labelled with proper warning signs.
- At all times:
    - allow only trained, authorized people into storage areas.
    - keep the quantity of corrosive material in storage as small as possible.
    - inspect storage areas regularly for any corrosion, damage, leaking containers or poor housekeeping. Correct all deficiencies as soon as possible.

How should I store containers of corrosives?

Before storing corrosives, inspect all incoming containers to ensure that they are undamaged and properly labelled. Do not accept delivery of defective containers.

Corrosives can destroy containers made of improper materials. Be sure to store corrosive materials in the type of containers recommended by the manufacturer or supplier. Protect containers from

slamming against each other when storing, transferring or using them. Keep them tightly closed when not in use.

How do I handle corrosive containers safely?

Containers with corrosives should always be handled carefully as damaged containers may leak.

Many workplaces receive corrosive liquids in large metal drums or barrels to refill smaller containers. Moving these full drums (weighing hundreds of pounds) by hand can be difficult and hazardous. Drum cradles are specially designed to ease this task with a forklift. You can also purchase special carbon caddies for bulky bottles and safety bottle carriers for smaller sized bottles. Safety equipment and laboratory supply retailers sell this equipment.

Self-closing, portable containers for carrying, storing and dispensing small amounts of corrosive liquids are also available. They are made from high-density polyethylene and come in different shapes with capacities up to 19 litres. These containers have spring-mounted spout caps that close automatically after filling and open automatically when the vapour pressure builds up inside the container (to allow vapours to escape and prevent rupture).

How do I dispose of waste material safely?

Corrosive waste is hazardous and must always be handled safely. Containers for waste must be made from corrosion resistant materials. Identify the contents of these containers with suitable labels.

"Empty" drums, bottles and other containers often have hazardous corrosive residues inside them. Never use these "empty" containers for anything else, no matter how clean they seem to be. Treat them as corrosive waste. It is possible to decontaminate "empty" containers. A chemical manufacturer or supplier can advise you about this.

Never dispose of corrosives down sinks or drains that are connected to sanitary or storm sewers. Dispose of them according to the manufacturer or supplier's directions or through hazardous waste collection and disposal companies. In all cases, dispose of corrosive waste according to the environmental laws that apply to your area. Contact the appropriate environmental officials for details about the disposal laws that apply to specific corrosives.

CLASSES OF CHEMICALS

Classification and related measures

It has already been said that agricultural workers may be exposed to a variety of agrochemicals at work. Most of these are toxic. Therefore, all agrochemical users must know how to use the products safely by increasing their knowledge of the hazards involved, both to themselves and others. Knowledge is a powerful weapon, and can be obtained by reading and understanding the label on the container. By strictly following the instructions on the label, agrochemical users will learn to protect themselves, other people, livestock, wildlife and the environment.

- **Classification**

  The hazards of the many thousands of agrochemicals on the market are described as toxic, harmful, corrosive, irritant, flammable, explosive or oxidising. This is called the classification of toxic chemicals. Some agrochemicals may possess more than one of these hazards.

  The word "toxic" means that a substance would cause ill-effects if taken in. It should be noted that words such as "toxic" or "harmful " have specific significance when they appear on a label. These words usually are accompanied by a specific symbol (pictogram).

- **Chemical safety data sheets**

  A material Safety Data Sheet (MSDS) is available for every legally registered pesticides sold in RSA. These should be supplied to employers, agricultural officers and extension workers, community leaders and everybody else that would like to see one. Such data sheets contain essential detailed information regarding the identity and classification of the product, the hazards it represents and the appropriate safety precautions and emergency procedures.

In addition to the essential information on the label, less hazardous agro chemicals might be accompanied by product information documents. Such documents would be indispensable in instances where chemical safety data sheets are not provided. This information is given to the user, at no extra cost, because it is important. Every user should read, understand and follow the instructions to ensure safety and health when using these chemicals.

This information should include:

- instructions on how, when and where to use the product safely and effectively;
- explanatory notes on specific matters such as dosage /application rates, timing and method of treatment or application;
- warning to prevent incorrect or inappropriate use;
- notes for observing any safety intervals between the application of a chemical and harvesting; or between the treatment of an animal and the consumption there of or its product, such as milk;
- expiry date of any product or its container if it is likely to deteriorate under normal storage conditions;
- general instructions essential to proper use such as mixing, application, compatibility with other products, preferred storage conditions and disposal of surplus and empty containers;
- description of necessary safety precautions such as the wearing of protective clothing and what to do in the event of contamination or emergency;
- warning about avoiding harmful effects on livestock, wildlife and the environment;
- instructions concerning first aid and advice to doctors indicating what to do in the event of poisoning and special antidotes that may be available or other emergency measures.

- prohibition on the reuse of empty containers except those specifically designed and intended for such reuse.

Agro chemicals without a label indicating the above mentioned should not be used. It is illegal in RSA to sell or keep in stock a pesticide that does not contain a complete label. Employers should ensure this practice on a farm.

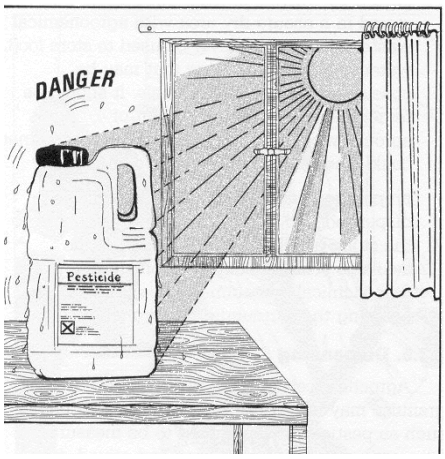
Agro chemical users should not attempt to use the product until they have read and understood the label or the markings. They should seek the advice of the employer, agricultural extension worker or community leader in case of doubt.

When an agro chemical product is unknown and lacks information it should not be used. If inquiries fail to reveal its identity, it should be disposed of safely.

SAFETY REGULATIONS

ADHERING TO SAFETY REGULATIONS

Why should I be careful when using and storing agro chemicals?



Agro-chemicals can be a toxic, oxidising and / or corrosive agent.

Oxidising materials have the ability to convert into chemically flammable materials. To be an "oxidiser", the material provides its own oxygen which combines chemically with another material in such a way that it increases the chance of a fire or explosion. This reaction may be spontaneous at either room temperature or with minor heating. Thus, oxidizing liquids and solids can be severe fire and explosion hazards. Bromine and fluorine are also oxidisers.

Agro-chemicals can also be corrosive. Corrosives are materials that can harm and chemically destroy body tissues on contact. Corrosives can also damage or destroy metal. The effect on tissue and metal depends on the corrosive agent and its concentration. Corrosives can begin to cause damage the moment it touches the skin, eyes, respiratory region, digestive area or the metal. MSDSs or product labels should be consulted for the specific effect it has on tissue or metals and also for procedures to follow in case of contact.

THE PRINCIPLES OF THE OCCUPATIONAL HEALTH AND SAFETY ACT

Safety

- Keep agro chemicals locked away from children and untrained workers.
- Chemicals should be locked up in a separate store, away from feed, seed and fertiliser to avoid contamination by spillage or vapours from unstable chemicals.
- In the case of fire or floods these materials will be confined to one area.

Read the label carefully

- Avoid poisoning
- Wash the applicator after you have used it.
- Keep away from the spray drift or dust cloud.
- Do not smoke, eat or drink while applying the pesticide.
- Take a bath when you have finished and put on clean clothes.
- Wash contaminated clothing.

When working with a pesticide you should wear:

- Rubber gloves.
- Rubber boots.
- A face shield.
- An apron.

Do not harm the environment

- Apply pesticides only when it is absolutely necessary.
- Keep to the dosage prescribed.
- Apply pesticides only on windless days.

- Choose pesticides that work quickly or that are safe to wildlife.
- Do not contaminate water by drift or when washing application equipment.
- Use only pesticides that are prescribed for your particular problem.

How to store and transport pesticides

- Always pack or load pesticides in such a manner that the containers will not be damaged.
- Keep the container in a cool place, away from direct sunlight or near fire.
- Store pesticides away from food and seed.
- Do not store pesticides in containers which normally hold food or soft drinks.

• Never pour pesticides into cooldrink bottles or food containers

• Do not use pesticide containers or packaging materials for storing water or food

Application equipment

- Always use equipment that is in good working condition.
- Service your equipment regularly and fix leaks immediately.
- Clean the equipment properly after use and do not leave pesticides in the applicator overnight.
- DO NOT throw the rinsing water into rivers, dams or onto grazing after you have cleaned the equipment.

- Application equipment must be calibrated properly.

In case of spills, have on hand a:

- Broom.
- Spade.
- Supply of dry fine sand.

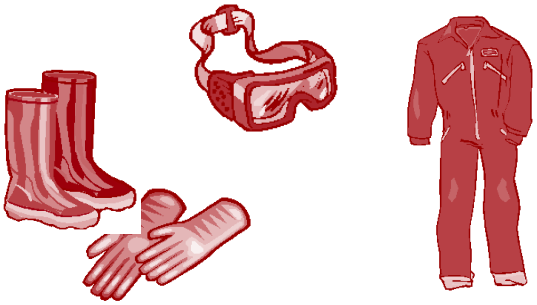
In case of expired or contaminated material, have on hand:

- Large containers (1/3 of a 200 l drum) for disposal of contaminated material and empty containers.

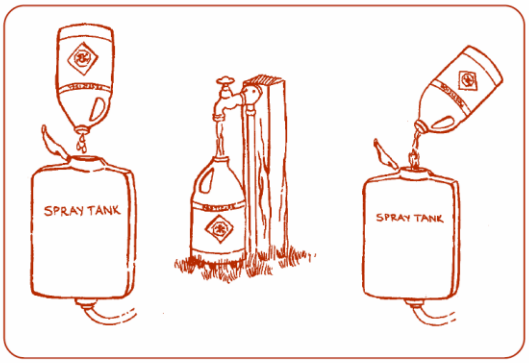
Protective equipment must be available and used

<u>Protective clothing includes:</u>

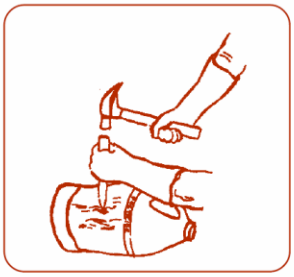
- Overalls.
- Rubber gloves.
- Face shields.
- Goggles.
- Boots.



Disposing of Agro-chemical containers in a safe way.

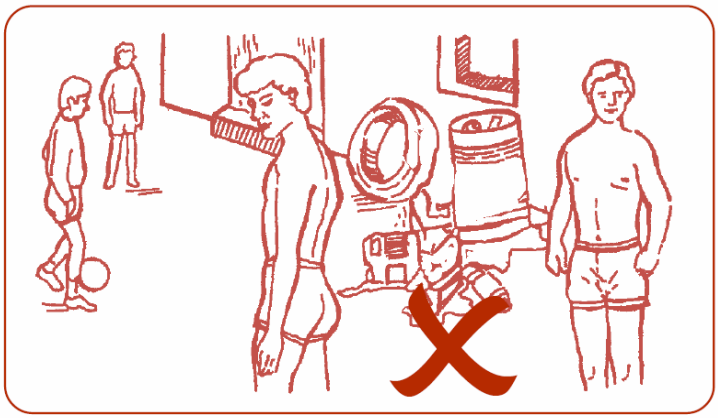


- Empty containers must be drained and rinsed **three times** with clean water:
  - Pour remaining pesticide into spray tank
  - Rinse with water and empty into spray tank



- Make holes into them so that they cannot be used again

- Ensure that the container is empty.
- Rinse the container three (3) times with clean water.
- Put rinsing water into the spray tank and spray it onto the fields.
- Make holes in the container and bury it in a specified area.
- Make use of a collection service to get rid of empty containers.



- Do not dump containers in any place
- Bury them in a pit in the ground far from homes and animal pens
- The pit must be on ground that is relatively high and flat. The soil should not be too sandy

- The pit must be at least 50 m from any water source (river, dam, spring, borehole, etc.).
- Line the pit with a 3 to 5 cm thick layer of lime.
- Put flattened containers and other farm waste in the pit in layers of not more than 10 to 15 cm deep.
- Cover the pit between deposits to prevent the contents from getting wet when it rains.
- When the pit has been filled to a level 50 cm from the top, seal and compact it with soil and stack the top with a final mound to force rainwater to run off.
- Erect a signpost in the area that indicates its purpose.

AGRO-CHEMICAL

What does the label say?

- Always read the label and follow the instructions

- The colour band and pictograms on the container tell you how to handle, apply and store a pesticide.
- The colour band also contains warnings concerning animals and the environment.
- The colour of the band indicates the hazardous (dangerous) degree to people.

◆	Red	— very toxic/toxic
◆	Yellow	— harmful
◆	Blue	— caution
◆	Green	— acute hazard unlikely during normal use

HANDLING PESTICIDES

Mixing Pesticides:

- When mixing pesticides

WEAR:		eye protection	
		rubber gloves	
		rubber boots	

Applying pesticides:

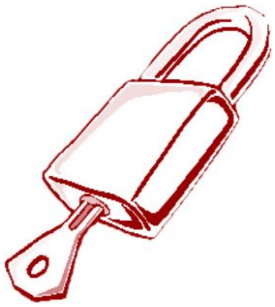
- When applying pesticides

WEAR:		mouth protection	
		rubber gloves	
		rubber boots	

STORAGE		ADVICE		ENVIRONMENT	
	Keep locked away from children and animals		Wash after use		Dangerous/harmful to animals
					Dangerous/harmful to fish—do not contaminate rivers and dams

	DO NOT store food in empty pesticide containers
	DO NOT store pesticide in food containers
	RINSE empty pesticide containers and DESTROY them

APPROPRIATE STORAGE METHODS FOR VARIOUS PRODUCTS



Prevent the risk of agro chemicals and stock remedies being used to poison livestock, people and even to destroy crops. Losses are costly and can be avoided by efficient security.

Product segregation

- Separate herbicides from other agro chemicals.
- "Very toxic/Toxic" products should be grouped together.
- Flammable products should be interspersed with non-flammable products of their own group.

CHAPTER 5

MONITOR, COLLECT AND COLLATE AGRICULTURAL DATA

In this chapter we explore the following concepts:

- What is Agricultural data
- Reasons why we collect agricultural data
- Elementary methods of data collection
- Estimate, measure and calculate
- Collate data
- Identify the relevant data
- Record collated data and create a report
- Health and Safety measures applicable to data collection

WHAT IS AGRICULTURAL DATA?

Definition:

The process of gathering information, such as profit margins per cultivar, pest and disease infestations, weather and climatic information, rainfall, costs, economic conditions – and analysing it to be able to find patterns that will help us work more efficiently, sustainably and profitably on a farm.

WHAT KINDS OF DATA DO WE COLLECT?

- Occurrence of pest and disease infestations.
- Weather and climatic information – year on year.
- Rainfall & Soil sample data.
- Costs of agricultural inputs.
- Yield data.
- Prevailing economic conditions in the sector, country and internationally.
- Production costs per crop.
- Soil and fertilisation costs and applications.
- Pest and Weed Control application programs and statistics.
- Non-target species data.
- Crop quality margins.
- Agronomic data.
- Profit margins per cultivar / per crop / per block / per orchard / per Hectare.
- Agricultural photographic data.

THE REASONS WHY WE COLLECT AGRICULTURAL DATA

We collect agricultural data in order to gather information on the patterns and processes of the environment. Patterns of the environment include rainfall, climate, dry cycles, original vegetation, seasons, movement patterns of animals, etc. Processes of the biophysical environment include the interaction and the relationship between food webs, human activities, soil, climate, water, plants, animals and solar energy.

It is always useful to have detailed records and data. This will help us to ensure that we make optimum decisions in order to maximise profits, production and quality, whilst keeping risks and problems to a minimum.

ELEMENTARY METHODS OF DATA COLLECTION

ELEMENTARY METHODS OF DATA COLLECTION THAT ARE IMPORTANT IN AGRICULTURE

Foundational knowledge on measurement:

Measurement is how we determine the exact capacity of something that is solid, liquid or gas form.

A carpenter needs to know the length of a piece of wood. It has to be right size.

A baker needs to know how much flour he/she is buying. If he/she is baking a lot, he/she needs a greater quantity.

If a person works in the city, he needs to know how long the train journey is. He doesn't want be late for work!

Measuring Instruments:

For each type of measurement, there is a particular measuring instrument which is most suitable to do the job. It will be impossible to list all the possible measuring instruments, thus we will look at the most common instruments and welcome your knowledge and experience to enhance understanding of this section.

When using any measuring instruments, ensure that measurement is:

Accurate; precise and viewed squarely off the scale of the measuring instrument

Definition:

Tensiometer: A device for estimating soil moisture levels by measuring the negative hydraulic pressure of water in soil; a porous, permeable ceramic cup connected through a tube to a manometer or vacuum gauge. (It works exactly like the root of a plant).

INTERPRETING A GAUGE

The most commonly read gauge on a farm, is normally that of a tensiometer & pressure gauges

Irrigation requires a relatively high investment in equipment, fuel, maintenance and labour, but offers a significant potential for increasing net farm income. Frequency and timing of water application have a major impact on yields and operating costs.

To schedule irrigation for most efficient use of water and to optimise production, it is desirable to frequently determine the soil water conditions throughout the root zone of the crop being grown. A number of methods for doing this have been developed and used with varying degrees of success, but the two methods, which have proven most practical for field use, are tensiometers and electrical resistance meters.

A tensiometer is a sealed water-filled tube, equipped with a porous tip installed in the ground to the desired root zone (Figure 1). In dry soil, water is drawn out of the instrument, reducing the water volume in it and creating a partial vacuum. This is registered on the gauge. The drier the soil, the higher the reading. Irrigation reverses this action. The vacuum created by dry soil draws water back into the instrument from the soil. This in turn results in a lower gauge reading.

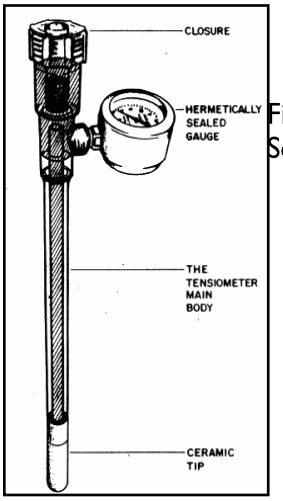
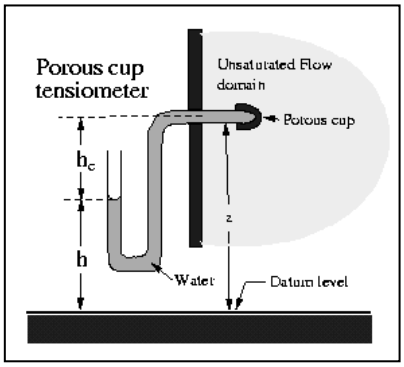
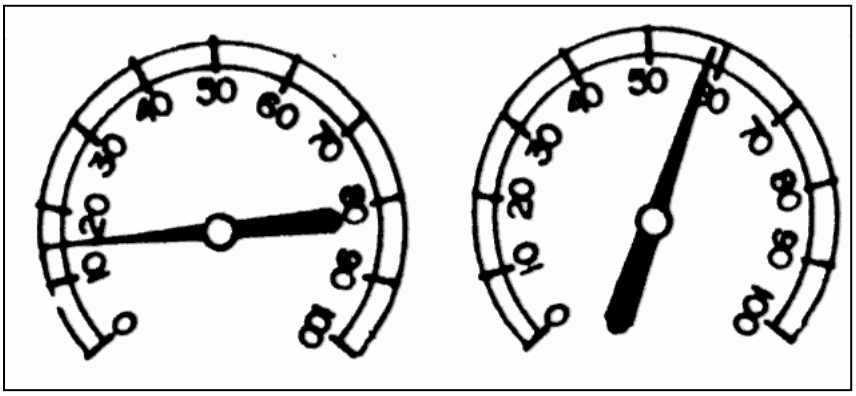


Figure 1: Typical tensiometer and its parts. Source: James (1988).



The instrument is in effect a "dummy root," equipped with a gauge that continuously registers how hard the roots are working. A gauge reading of 50 indicates the same amount of moisture whether in sandy or clay soil. Because of the tensiometer's unique principle of operation, it needs no calibrations, under normal operating conditions, for various types of soil. The extension worker or grower can plot the tensiometer readings on a graph during the growing season. Such a record is useful in planning future irrigation requirements and making year-to-year comparisons. Generally, tensiometers continuously show the available soil moisture in the crop's root zone. The tensiometer covers the entire range of soil moisture required for maximum growth. Growers quickly learn the range of tensiometer readings in which they should start or stop irrigation to produce best results for their crops and conditions. The following interpretations of tensiometer readings have proven practical or useful under field conditions (also see Figure 2).

Figure 2. Tensiometer readings. Source: James (1988). Note: The reading on the left says soil has adequate water; the one on the right says soil moisture is low.



Readings 0 - 10: Saturated soil - These readings often occur for a day or two following irrigations. Continued readings in this range indicate over irrigation, danger of waterlogged soils, inadequate root aeration, root rot, or high water table.

Readings 10 - 30: Field capacity - Farmers should discontinue irrigations when readings in this range occur, to prevent waste of water through percolation and waste of nutrients through leaching.

Readings 30 - 60: Usual range for starting irrigations - Root aeration occurs anywhere in this range. In general, in hot dry climates or coarse-textured soils, farmers should start irrigating when they see readings in the lower part of this range; in the upper part of this range, in cool, humid climates or soils with high water-holding capacity. Starting irrigations in this range ensures readily available soil moisture at all times, which is essential for maximum growth. It also provides a safety factor, with a reserve of soil moisture to compensate for such practical problems as delayed irrigations or inability to obtain a uniform distribution of water to all portions of the crop.

Readings 70 and higher: Stress range - A reading of 70 does not necessarily indicate that the crop is using all available moisture, but that readily available moisture is getting dangerously low for ensuring maximum growth.

Readings of 80 - 85: Top range of accuracy of the tensiometers - The number of tensiometers for an installation varies widely with crop and local conditions.

MEASURING SOIL MOISTURE WITH TENSIOMETERS

The position in the field where the tensiometers will be installed must represent large sections of a field. Three tensiometers, one each, at a depth of 30, 60, and 90cm etc. in accordance with the effective root zone must be installed in a group to form a measurement station.

Note the following important points when installing tensiometers:

Step:	Action:
1	Fill the tensiometers with water that was boiled and then cooled. They must then be left for a few days until all the pores in the ceramic tip are saturated with water.
2	Use a soil auger to make a hole slightly shallower than the length of the tensiometer. In the bottom of this hole a small hole is pressed using a metal pipe of the same diameter

	as that of the tensiometer. The full length of the ceramic tip must fit into the small hole.
3	Press the tip of the tensiometer into the small hole. For accurate readings, the ceramic tip must be in close contact with the soil. Fill the opening around the shaft with moist soil and ram the soil down so that water penetration will be normal.
4	Fill the tensiometer with water that was boiled and then cooled. The water in the tensiometer must be replenished daily after a reading was taken. Use a small vacuum pump for sucking air out of the tensiometer.
5	Record the suction tensions early in the morning of every day and plot the values on a graph.

The tensiometer indicates the stress experienced by the plant while it absorbs water. Young crops must be irrigated as soon as the tensiometer at a depth of 30 cm, registers a value of 35 kPa. Older cotton must be irrigated as soon as the tensiometer at a depth of 60 cm registers a value of 4O kPa. The tensiometer at the maximum depth is used to indicate over irrigation and it must always register a value larger than l0 kPa. Tensiometers can also be calibrated to indicate the amount of water required to wet the soil profile to field capacity.

MEASURING

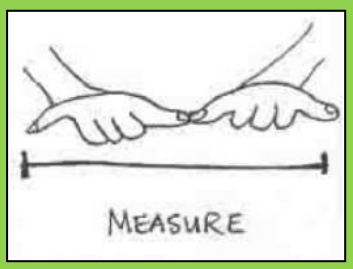
When applying the basics of collecting Agricultural Data, you will almost constantly be required to measure. But measurement may mean different things to different people.

Definition:

The International System of Units (SI):

All systems of weights and measures, metric and non-metric are linked through a network of international agreements supporting the **International System of Units**. The International System is called the **SI**, using the first two initials of its French name *Système International d'Unités*.

There are seven SI base units:



- The **meter** for distance,
- The **kilogram** for mass,
- The **second** for time,
- The **ampere** for electric current,
- The **mole** for amount of substance, and
- The **candela** for intensity of light.

There are also other units of measure derived from SI – some of these that you might encounter include:

- The **newton** for force and the **Pascal** for pressure;
- The **joule** for energy and the **watt** for power;
- The **degree Celsius** for everyday measurement of temperature;
- The traditional mathematical units for measuring **angles** (degree)
- The traditional units of civil **time** (minute, hour, day, and year);
- Two **metric** units commonly used in ordinary life: the liter for volume and the ton (metric ton) for large masses;
- **Knot**, units traditionally used in meteorology;
- The **hectare**;
- The **bar**, a pressure unit.

Irrigation aids

Irrigation aids are necessary to make the correct decisions. Water and energy are expensive and unnecessary irrigation cannot be justified. Instruments and appliances available measure one or more of the following soil water conditions.

- **Measuring soil moisture with gravimetric sensors**

  By using a soil auger soil samples can be taken at increments of 20cm to a depth of 90 to 120 cm. Samples can be taken anywhere in the same irrigation section or lateral. Soil samples from the same depth are combined and the mass determined before and after drying. Soil samples must be dried for at least 24 to 30 hours. The difference in mass before and after drying indicates the amount of water available in the soil. The difference between field capacity and the measured water content of the soil indicates the water deficit that must be replenished by irrigation. A good mass meter is the most expensive item required.

- **Measuring soil moisture with a neutron moisture probe**

  This is a sophisticated method which requires an expensive instrument. The installation of access tubes in the soil requires the same time and effort as the collecting of one set of gravimetric samples. Producers can save by sharing the costs of this instrument. In some parts of the country private enterprises deliver a hygrometric service and make irrigation recommendations on a contractual basis. A correctly calibrated instrument can directly indicate the soil water content in mm per 20cm increments. When the instrument is connected to a computer with the necessary software, irrigation requirements can be obtained immediately after the measurements are completed.

- **Measure soil moisture with electronic sensors**

  Like tensiometers, the sensors must be buried at various depths. The soil above the sensors must be filled up as normally as possible and the sensors must be allowed to reach equilibrium with the surrounding soil moisture before measurements are made. The change in electrical conductivity when the soil dries out is related to the water content of the soil. The sensors must be calibrated for every soil type.

OBSERVING

Definition:

Observing: Observation basically means watching something and taking note of anything it does. For instance, you might observe a bird flying by watching it closely. The sciences of biology and astronomy have their historical basis in observations by amateurs, therefore Agricultural data is often much enhanced by focused observation.

How and what to observe?

Observation is one of the most important aspects of collecting Agricultural Data. It is a skill developed through dedicated action and meticulous methodology.

Observation for feeding 10 billion people

The FAO (Food and Agriculture Organization of the United Nations) estimates the number of undernourished people in the world at over 840 million - mostly living in developing countries of the Asian-Pacific and sub-Saharan Africa regions. Above all other goals that are the focus of international cooperation among countries, the eradication of famine might be considered to be the most universally supported.

The United Nations Millennium Declaration, adopted by the world's leaders at the Millennium Summit of the United Nations in 2000, captured the aspirations of the international community for the new century. It spoke of a world united by common values and striving with renewed determination to achieve decent standards of living for every man, woman and child. The first of the eight agreed 'Millennium Development Goals' is to "Eradicate extreme poverty and hunger" - with the specific target of reducing by half the number of undernourished people by 2015.

Information needs

Global agricultural production systems must be enhanced, well maintained, and reliable if we are to routinely meet the food requirements of the Earth's projected 10 billion inhabitants beyond 2050. Sustainable development practices, consistent with protection of biodiversity and ecosystems, are seen as the key. Such practices require a broad range of information on all scales. Parameters of importance include:

- Crop yield, land degradation, and desertification;
- Land-cover, land-use, and vegetation state;
- Prevention of soil erosion by means of different methodologies e.g. no tillage concepts.
- Soil characteristics such as fertility and moisture levels;
- Freshwater availability including from rainfall, fluxes in small water bodies, and groundwater resources;

- Total irrigated area;
- Population distribution, production intensity, and food provision.

This data is required at various (from local to global) scales and requires fusion of multiple datasets quantifying both the physical state of the land and socio-economic parameters. Such information will help provide food producers with:

- Information on changes in land usage and productivity,
- Improved market supply and demand forecasts, and
- Seasonal and inter-annual action plans - taking account of seasonal forecasts and predictions of major climatic events such as El Niño.

COLLECTING SAMPLES

Definition:

Agricultural Sampling: Removing and/or examining a portion of an entire set (i.e., examining three leaves per plant on 20 plants in an 11 ha field).

There are various well-known and tried and trusted methods of sampling. Before we explore these different methods, let us first decide what types of things we could possibly sample and what those samples could tell us.

- **Scientific methods of sampling:**
  - *Random sampling* - collecting samples based on chance, rather than on making conscious choices for each sample; ensures that the samples collected are likely to show an accurate estimate of the situation.
  - *Systematic sampling* - Samples taken in a periodic and regular fashion.
  - *Cluster sampling* - is sampling in which groups, not individuals, are randomly selected.

- *Stratified sampling* - A sampling pattern in which the site is divided into (usually) non-overlapping sub-areas. Different sampling densities and sampling patterns are used in the different sub-areas.

- *Quota sampling* - The selection of a predetermined number of elements from different sectors of the population.

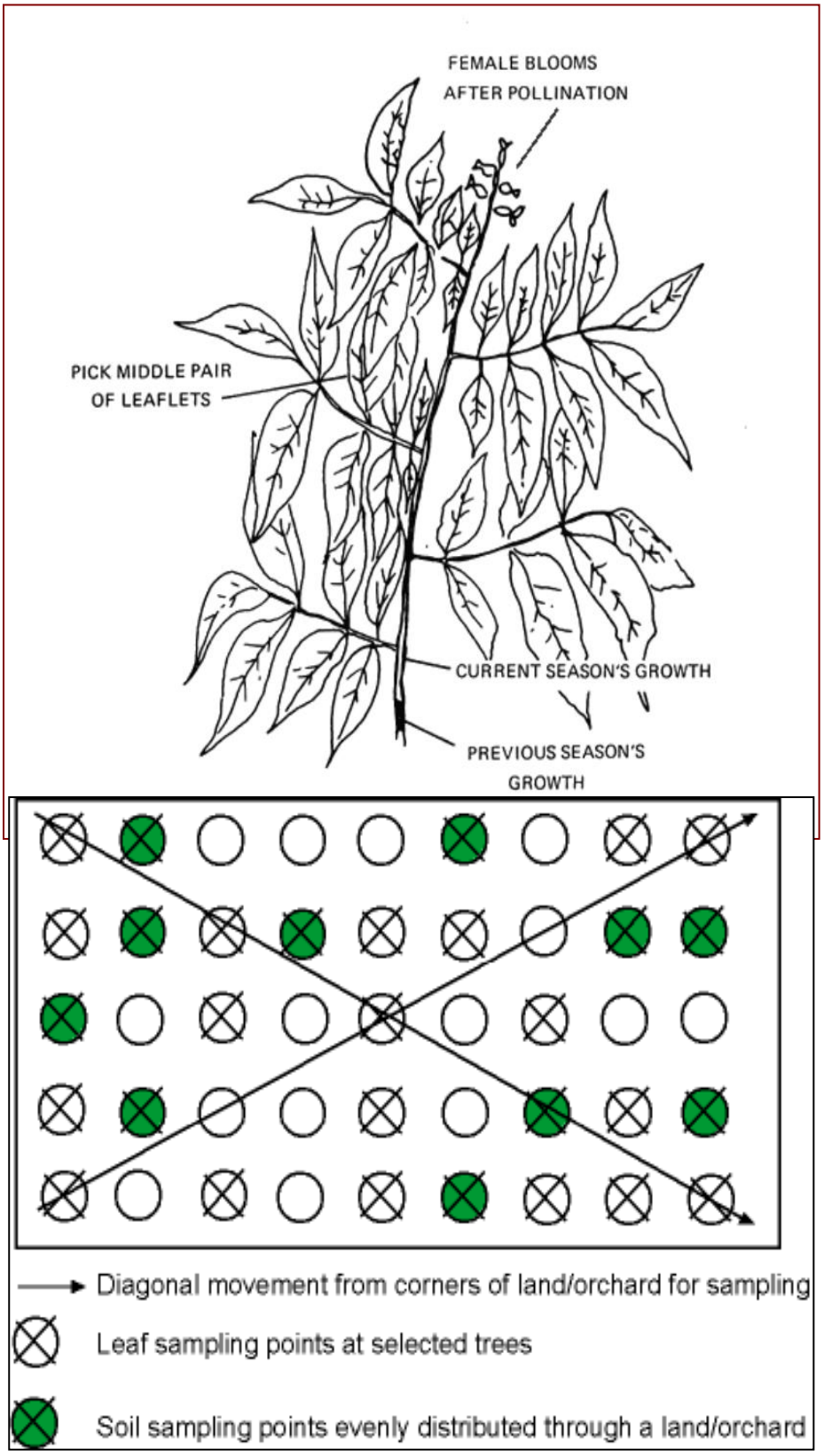
➢ **What do we sample in terms of Agri-business?**

The most important things that we sample on a farm, and the reasons why we sample, are:

What we sample:	Why we sample it:
Leaves	To determine whether the plant's fertilisation needs. To check for pests and diseases.
Soil	To determine the structure and fertility of the soil for correction and soil preparation purposes.
Fruit/flowers	To determine ripeness or for fruit grading purposes.

LEAF SAMPLING

A single leaf or soil sample should be representative of an area not greater than 3 ha, but this can depend on the crop size planted. However, if there is soil variations separate leaf and soil samples must be taken and the orchard management adapted accordingly.



Taking representative soil and leaf samples from orchards as per example:

- The time of leaf sampling as well as leaf position is very important and is shown in the figure. Leaf analysis is only applicable for producing mango trees (normally a tree age of 5 years and older).
- Select about 20 healthy trees by walking diagonally from the corners through the orchard (see figure). The trees should be homogeneous in appearance and representative of the orchard.
- Exceptionally good or poor trees must not be sampled.
- The 20 selected trees must be clearly marked, for example with paint, so that both the soil and leaf samples can be taken from the same trees every year.
- Where possible, pick 4 leaves from alternate sides of the tree at about shoulder height. Eighty leaves per sample should be sufficient.
- Different cultivars should be sampled separately.
- Leaves sampled must be free of sunburn, disease and insect damage.
- Leaf samples should be collected in the morning, after the dew has dried off.
- Leaf samples should not be taken if trees are under stress, i.e. drought or high temperatures. After a heavy downpour, wait at least 2 weeks before taking samples.
- After sampling, leaves should be placed in clean, perforated or open plastic bags.
- If samples cannot be delivered immediately (within 48 hours), they can be stored in a refrigerator and should be transported in a cooler bag. The sample must be accompanied by the relevant orchard information including previous production figures, tree age and fertiliser programs of the past. Any problems concerning the specific orchard, such as small fruit, should be mentioned.

SOIL SAMPLING

Sampling depth:

- Topsoil 0 - 300 mm.
- Subsoil 300 - 600 mm.

Number of samples: A sample comprises of a combination of at least 10 sub samples. A composite sample should not represent more than 3 ha. Samples from different orchards or lands should not be combined.

Distribution of sampling points: Take samples by walking diagonally from the corner through the orchard or land. In an established orchard, topsoil and subsoil samples should be taken at the same trees selected for leaf sampling. Soil samples must be taken under the canopy of trees in the middle between the stem and the drip area perimeter.

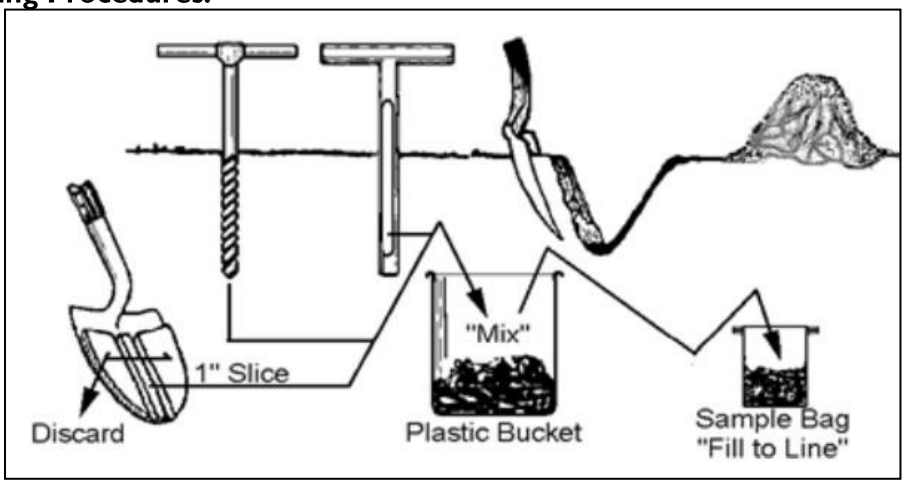
Method of sampling: Clear the soil surface of debris, leaves and fertiliser. A soil sample must not be taken too soon after fertilising because this will contaminate the soil sample and lead to an incorrect analysis. The top and subsoil samples are taken by removing a core of soil from the top 0 to 300 mm and then from 300 to 600 mm soil depth, respectively.

Packaging of samples: Sub samples from an orchard or land should be combined in the respective bucket (not a fertiliser bag) and mixed thoroughly. A sample of about 2 kg is taken from the composite sample and dispatched in a clean, strong bag.

SOIL AND LEAF SAMPLING PROCEDURES

Soil and leaf samples are required for making fertilizer recommendations. A soil or leaf analysis is no better than the procedures used to collect the sample. For samples to be representative of the area tested, follow these steps for sampling:

Soil Sampling Procedures:



- Soil samples may be conveniently taken when leaf samples are pulled. Soil sample bags are available from your laboratory agent. They should be used for submitting samples to the laboratory. Supply all the information asked for on the soil sample bags.

- Use a spade, trowel, soil sampling tube, auger or other tool which can take a thin vertical slice of soil to a depth of 8 - 12 inches.

- Take at least 12 or 15 cores or thin slices at random over the area to be sampled. In general, one composite sample consisting of 12 - 15 cores should be taken for each block of trees. If possible, sample under the predominant variety. (For example: Stuart.) Place samples in a clean plastic bucket or other non-metal container and mix well. Fill the soil sample bag at least 3/4 full. **Do not use a galvanized bucket** if the soil is to be analyzed for zinc or other micronutrients.

- Cores should be pulled within the drip line, **not** between rows. The area included in one sample should have been uniformly fertilized and limed in the past. When collecting the sample, avoid high or low spots, eroded areas, and areas along roads and fences. Sample problem areas within an orchard separately.

- For field crops, soil samples should be taken before planting, so that the soil analyses can give an indication of the amount of fertilizer to be applied.

- Depth will be determined on how deep the roots of the plants penetrate the soil. E.g. for cotton three soil samples are taken at three different depths since the cotton root can penetrate the soil from 60cm-100cm. Soil samples are taken from 15cm, 30cm and at 60 cm.

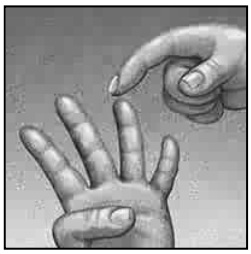
Leaf Sampling Procedures:

- Obtain plant analysis mailing kit from the area laboratory agent's office. One mailing kit per sample is required.
- Sample trees between July 7th and August 7th. (Sampling can be extended into mid-August without affecting the results.)
- Collect 100 middle-pair of leaflets from the middle leaf of this year's growth (see illustration). Use terminal shoots exposed to the sun. Avoid twigs from the interior of the tree. Collect leaflets from all sides of the tree. Avoid leaflets damaged by insects and diseases.
- Abnormal trees or trees not representative of the area should be sampled and sent separately. A complete and accurate description of abnormalities should accompany such samples.
- Sample trees of the predominant variety in a given block. If Schley is the main variety, sample Schley, if Stuart is the main variety, then sample Stuart, etc.
- Immediately upon collection, wipe leaves (entire surface, both top and bottom) with a damp cellulose sponge or cheesecloth to remove dust and spray residue. Do not allow the leaves to come into contact with rubber or galvanized containers. Partially air dry and place in the large envelope of the mailing kit.
- Complete the questionnaire obtained in each mailing kit. Place the completed in the smaller envelope together with a cheque made payable to The University of Georgia to cover any charges and mail it to the Plant Analysis Laboratory.

- If recent soil test data were not available, it would be advisable to collect a soil sample and have it sent to the Soil Testing Laboratory.

COUNTING

Counting plays a very big role in collecting Agri-data. A farmer may decide to count the number of weeds or pests in a specific area, in order to determine whether or not chemical pest control is necessary.



We also count the amount of fertilizer, and the number of plants or trees in any given area, in order to determine:

- "How much" fertilizer we should give.
- "How many" fruit it will deliver.
- "How much" money we spent to fertilise, pest control, etc. each and every plants.

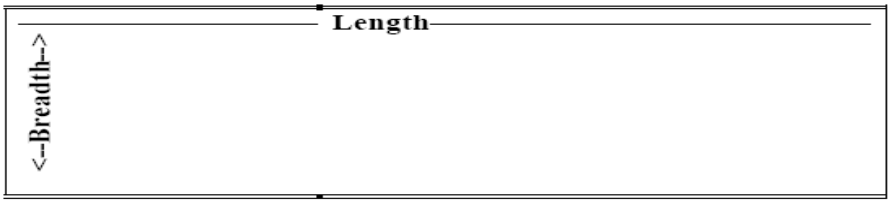
ESTIMATE, MEASURE AND CALCULATE

The farmer sometimes needs to estimate, measure and calculate agricultural data.

Length and breadth

Length is always the longer side(s) of a shape, while breadth is the shorter sides of a shape. In the example below, length is indicated by the double line while breadth is indicated by the single line. Length and breadth is measured in meters. Any shape that has length and breadth is a two dimensional shape.

You can estimate the length and breadth with your fingers. The length of one side is about six fingers long (i.e. one finger may be ☒2cm wide, so we can estimate that the length of this is 6 x 2 = 12cm) and the breadth is about 2 fingers long i.e. 2 x 2 = 4cm. Eventually you will be able to estimate the lengths by merely measuring it with your eye.

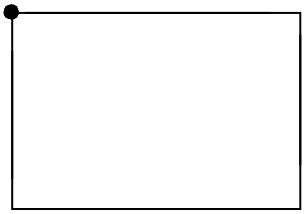


Perimeter

Definition:

Perimeter Perimeter is the distances from one point on the outside border of a shape, all the way around, back to the same point again. Perimeter and circumference is measured in metres.

Point A



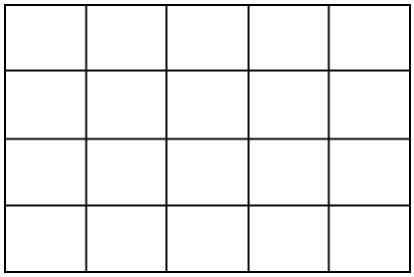
To calculate the perimeter of a rectangle, square, parallelogram:

P = 2 lengths + 2 breadths and the answer is in mm, cm, m or km

Area

Area is the amount of space a shape takes up in two dimensions i.e. length and breadth. The example below shows how a shape with a length of 5cm and a breath of 4cm, takes up a 20cm space. Area is measured in square meters.

5 cm

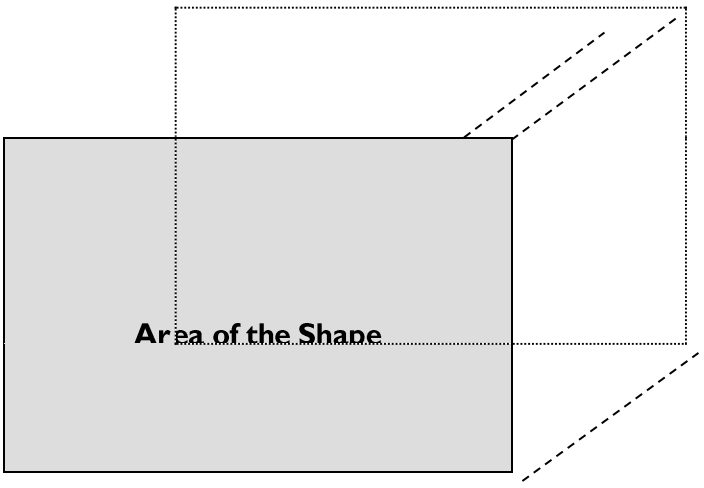


If you measure a space such as a room, then you will estimate the length and breadth by using a stride. A stride is a very large step and is the distance between the heel of the back foot and the toe of the front foot.

Volume

Volume is the space that a container can take on the inside. In order to determine the volume of a container, we need to add another dimension to the shape i.e. the height or depth.

Up to now, we have calculated the area of a shape, working with the length and the breadth. The length is one dimension; the breadth is the second dimension. If we now add height or depth to a shape, we add a third dimension and we can see how much go into it. The dotted lines in the figure below show how we have added the third dimension i.e. depth.

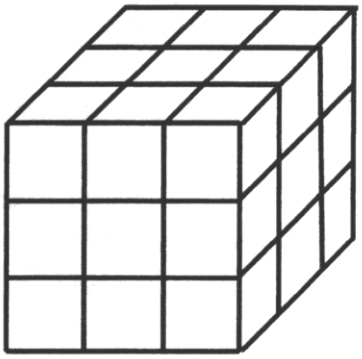


Length breadth height

To calculate the volume, we multiply the length by the breadth by the height. The unit of measurement is also multiplied and we end up with cubic metres i.e. m^3.

 Volume = length x breadth x height.

The box below is 3cm x 3cm x 3cm. We fill the box with 1cm x 1cm x 1cm cubes. This illustrates the volume of $1cm^3$ cubes that can fit into the box i.e. 27 square boxes or 27 cm^3.



Drawing Scales

Drawing scales are used to reduce the size of a large article so that it can be represented on a piece of paper. Maps normally use scale to indicate to which extent a piece of land has been reduced.

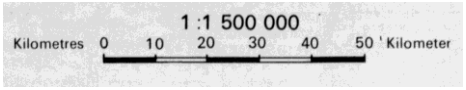
The same principle is used in engineering drawings to illustrate the size of a component or engineering object.

A scale is the ratio of

- the distance between two points on a map vs.
- the actual distance between two points on a surface

Scales can be represented in one of three ways:

- as a **ratio** 1:1 500 000
  - as a **fraction** $1/1\ 500\ 000$
  - as a **graphic scale**



Which means that for each 1 unit of measurement on the map, the distance is 1 500 000 of the same units of measurement on the real surface.

Example:
A scale drawing is a drawing where the accurate dimensions of an object or figure or area are reduced or enlarged. The scale drawing is the exact duplication of the original figure, shape or

object, but it is smaller.

An area is shown on a map as the drawing bebw. The scale on the map is:

1:1 500 000.

We measure the length and breadth of this drawing, which is
10cm x 5cm. We can then calculate the actual size of the area
land, represented on the map.

1	:	1 500 000
1 x 5	:	1 500 000 x 5
5	:	7 500 000

So for every 5cm we measure on the
drawing, the real measurement on land is

7 500 000cm (or 7,5 km).

1	:	1 500 000
1x 10	:	1 500 000 x 10

The length in this case will be 15km on land.

SCOUTING

Definition:

Agricultural Scouting: Systematic or regular monitoring of a crop or ornamental planting or landscape.

Scouting, or monitoring pest populations, is part of an Integrated Pest Management (IPM) system. IPM prescribes treating the portions of a farm or field that have identified higher than threshold levels of pests, rather than treating the whole field, resulting in using less applied farm chemicals. With the introduction of new genetically modified crops, it is important to have a basic knowledge what the technology implies on the specific crop, e.g. maize, cotton, soy bean. At present (2006)

only these three crops are considered as genetically modified or "transgenic" and the scout should take note of the inherent characteristic of the crop with regards to resistance to specific pests. For example, Bt-cotton (genetically modified) provides resistance to bollworms on cotton, and the scouting results on this type of cotton maybe different from what is expected. The relevant data in each case should be presented when scouting for a specific purpose, be it pest control, or to monitor the expression of the technology in the plant or both.

For pest control and related damage, spotting signs of damage doesn't automatically mean you should take action. It all depends on the type of crop you are working with and which pest has most impact on the crop, the type of damage caused, the severity of infestation, and your own personal preferences. For instance, does the damage fall into any of the following categories?

- **Economic damage:** Some insects, such as termites, cause economic damage to a home, yard, or garden.
- **Health risk:** Some insects and related creatures are a concern because they carry disease or are detrimental to your health. A good example is the tick, one species of which is responsible for transmitting Lime disease, or mosquitoes of which some can transmit the malaria parasite.

After you identify a problem, determine the potential for damage and how much you or your landscape can tolerate. Once you know what you're up against, find out if the damage can be controlled with less-toxic strategies. Use the least harmful pesticides as a last resort.

Example: Scouting in the cotton field (Cotton Management Guide, revised 2006)

It is important to distinguish between conventional cotton and biotech cotton types. Biotech cotton types include bollworm resistant types such as Bt-cotton (i.e. NuOPAL and NuOPAL RR), and herbicide resistant cotton types (i.e. DeltaOPAL RR). The method of scouting on both conventional and biotech types is similar, but the management and interpretation of scouting results differ. For both conventional and biotech cotton, a cotton field must be investigated / scouted in such a way that the observations made are representative of the specific field. The field should be divided into blocks not larger than 15 hectares. The observations collected from such a block will then indicate the extent of the control to be applied to the specific block. In order to obtain a reliable sample of observations, plants need to be chosen randomly from the block. Choosing plants in 8 groups of 3 plants each, moving diagonally across the field, is satisfactory (24 plants per block). Furthermore, it is advisable to scout each block from a different direction each week. Scouting blocks must be chosen

so that all the cotton in the block is of the same age and the block is not divided geographically. Cotton under rain fed and irrigated cultivation must be treated as separate units. For each block, a minimum sample of 24 plants should be randomly chosen and investigated for pests, except for spider mite that requires a sample of 48 plants.

For both conventional and biotech cotton types (bollworm resistant and herbicide tolerant types) 24 plants within each field and the entire plant, including young bolls and squares, should be examined thoroughly. The number of any pest found on the plant is recorded and if this is equal to or more than, the predetermined *economic control threshold*, control measures should be applied.

Examination of plants for bollworm (American, red and spiny)

The whole plant must be examined thoroughly. Particular attention should be paid to the upper plant parts, especially the squares, flowers and bolls. The numbers of bollworm eggs and larvae must be recorded on a suitable scouting sheet. Time taken to examine a single plant will depend on the age and size of plants. Approximately 5 minutes per plant can be used as a standard.

Bollworm resistant cotton:

In the case of bollworm resistant cotton, threshold levels are interpreted differently. The reason for this is that in instances of plant stress (i.e. drought or flooding) Bt-cotton plants may vary in the level of expression of the Bt-gene, especially in the flowers. This could create an opportunity for bollworm larvae to survive on Bt-cotton plants, which would provide a higher number of bollworm larvae found on a particular plant at any one time during scouting. One or more plants, which could exhibit this tendency to have more larvae, could create the impression that the field has many bollworm larvae and that the threshold is reached. The threshold level for bollworm on Bt-cotton is thus adapted to be interpreted as when more than 5 plants with bollworm larvae/24 plants are found, it would indicate that bollworm control should be considered. The emphasis is on the number of plants with 1 or more larvae, rather than the number of larvae per 24 plants.

Example:

Summary of scouting Procedures (cotton)

There are normally very specific procedures that are applied for scouting pests and diseases on various crops. Many of these scouting procedures have been scientifically determined and are recommended as such.

An example would be:

Scouting for bollworms on conventional (non-transgenic) cotton

- Select 24 plants per field randomly, or in groups of 3 at 8 randomly selected sites to cover the whole field.
- Examine all plant parts, to include upper and under leaf surfaces, stems, flowers, flower buds (squares) and bolls.
- Identify and count the number of bollworms per plant and record on a recording sheet or on a pegboard.

After 24 plants have been scouted add up the total number of bollworms scouted. The learner should be able to report on the number of bollworms found per field, per week, and be able to monitor these pests over a period of time.

It is important to get the correct scouting procedures, as related to the types of pests and diseases that might be relevant to your specific type of crop. For instance, of all bollworms present in South Africa, only one kind is a cosmopolitan pest mostly on all crops. Scouting procedures differ from crop to crop as well as threshold values. For instance, American bollworm on maize does not reach as economically damaging levels on maize as on cotton. Some other pests, like the maize stalk borer may contribute to injury levels on maize and the same may be true for various other crops and associated pests.

COLLATE DATA

BIOLOGICAL DATA

This normally includes collation of:

- Water quality;
- Environmental impacts;
- Occurrences of natural fauna and flora; and
- A count of invasive species, pests and diseases plants in the crop.

This type of report is important in terms of ensuring that Ecological Environments are not damaged and that the land, water and natural resources remain in optimum state for sustainable agricultural usage.

PHYSICAL AND ECONOMICAL DATA

Let's look at each in detail:

Type of data	Correct Method of collection	Why we need to collate this kind of data
Pests data	Sampling within individual fields is also done objectively. Surveyors strive to enter a given field without letting field conditions influence their choice of entrance location. Once in a field, a pest is sampled repeatedly along a line with fixed spacing so as to try to achieve an accurate estimate of the pest conditions in that portion of the field. Sampling is done by sweep netting, trapping, which can include but is not limited to sticky traps, light traps, pheromone traps, trap crops etc., inspecting individual plants, inspecting a certain unit of the ground, or by other means depending on the crop and the target pest. Typically a surveyor will employ multiple sampling methods in an individual field and will be estimating numbers of multiple insect species as well as the presence of disease or weeds.	A Pest Report can be used to decide when to scout and what to scout for, as well as to decide when or if a treatment should be applied. The recording of such data is important for interpretation of the findings. The grower/farmer/or person interested in the data, would like to analyse it to monitor pest and predator population densities in the field, which may have an impact on yield and require some kind of control measure.
Diseases data	These reports are normally a bit more complicated than pest reports. They normally include information on: **THE TYPE OF CROP** There are specific crops with very specific disease vulnerabilities. Accordingly, we will try to determine whether our farm's crops are more or less affected than average. **THE TYPE OF DISEASE** Only diseases that can cause us to lose our crop of that can have a financial impact on our crop are reported on. **PATHOGEN** This is the scientific name of the organism	These plant disease occurrences should be recorded and combined over a time period, and can be used to predict the timing of diseases, e.g. fungicide applications. However, exercise caution when using these data sheets because disease control in the field depends on many additional variables, some of which may not be included in any one report. Important variables include a fungicide's activity, such as whether a material is protective, eradicative, or curative, as well as fungicide coverage and the time intervals between applications. Other variables that might affect disease control include additional

Type of data	Correct Method of collection	Why we need to collate this kind of data
	that causes the disease in the first place. **WEATHER STATION AND SENSOR LOCATION** The location of weather monitoring equipment relative to the crop canopy. The sensors that monitor the environmental variables are important, and they should be located within the crop canopy in order to give accurate information. **INPUT VARIABLES** Measured environmental variables are recorded by automated weather stations or other types of monitoring equipment. Variables typically monitored include temperature, precipitation, relative humidity, and leaf wetness, wind.	environmental variables that might not be included in the model, host phenology or growth stage, and pathogen virulence.
Agro-chemicals data	This type of data report should include information such as wind speed, humidity and temperature, every fifteen minutes, types of chemicals applied. Reasons for the application, results of the application. It is important to compare year on year information and statistics. It is also important to have regular stockholding and stock rotation reports, as agrochemicals do not have unlimited shelf life.	It is important to have this type of data recorded and compared with previous records, in order to plan an effective spray program that will ensure that the crop yield and quality is optimum (at its best), without applying chemicals that will harm the environment, or limit the economic lifespan of the crop.
Crop data	This type of data report normally includes a list of the following: • The type of crop and cultivar. • Type of topography and soil the crop is planted on. • The soil preparation and fertilisation actions that was affected. • The spray program and quantities of agrochemicals, herbicides, pesticides and fertilisers applied. • Plant manipulation actions taken.	It is important to have this type of data recorded and compared in order to plan and revise your management programme for effective, cultivar selection, to take note of changes over time, for soil preparation actions, agrochemical application programs, plant manipulation and marketing actions that will ensure that the crop yield and quality is optimum (at its best), whilst ensuring maximum profitability.

Type of data	Correct Method of collection	Why we need to collate this kind of data
	• The grade and quality of the crop yielded. • The tonnage of the crop yielded. • The price per ton income for the crop. • The profitability of the crop. • Notes on Economic and External factors that might contribute to the overall crop yield, quality and profitability. This data report should be compared season on season and year on year.	
Stock control data	It is important to have regular stockholding and stock rotation reports, as agrochemicals do not have unlimited shelf life, and some chemicals can be de-registered in time, due to a proven negative effect on the environment.	It is important to collate stock data in order to identify problems with stock, compare expiring dates, plan effective, agrochemical application programs, whilst ensuring optimum cash flow and for audit purposes.
Economic indicator data	These include indications of items such as the Rand vs Dollar exchange rate, the price of oil, the price of gold and many more.	An economic indicator is simply any economic statistic, such as the unemployment rate, GDP, or the inflation rate, which indicate how well the economy is doing and how well the economy is going to do in the future. This will influence all our decisions in terms of crop planning, cash flow and help us to plan strategically for our commercial farm.
Maintenance information	Service technicians perform routine maintenance checks on diesel engines and on fuel, brake, and transmission systems to ensure peak performance, safety, and longevity of the equipment. Maintenance checks and comments from equipment operators usually alert technicians to specific problems. With many types of modern heavy and mobile equipment, technicians can plug diagnostic computers into onboard computers to diagnose a component needing adjustment or repair. After locating the problem, these technicians	This will influence all your decisions in terms of crop planning, cash-flow and help you to plan strategically for planting, pruning, harvesting and transportation / distribution actions. In order to make decisions on whether to replace equipment, repair equipment and to take note of the possible causes of maintenance problems, it would require comparison and integration of the findings on this kind of data. Whether it be maintenance on machinery, computer technology, or maintenance on farm equipment such as irrigation pipes, keeping

Type of data	Correct Method of collection	Why we need to collate this kind of data
	rely on their training and experience to use the best possible technique to solve the problem. If necessary, they may partially dismantle the component to examine parts for damage or excessive wear. Then, using hand-held tools, they repair, replace, clean, and lubricate parts as necessary. In some cases, technicians calibrate systems by typing codes into the onboard computer. After reassembling the component and testing it for safety, they put it back into the equipment and return the equipment to the field. Many types of heavy and mobile equipment use hydraulics, to raise and lower movable parts. When hydraulic components malfunction, technicians examine them for fluid leaks, ruptured hoses, or worn gaskets on fluid reservoirs. Occasionally, the equipment requires extensive repairs, as when a defective hydraulic pump needs replacing. In addition to conducting routine maintenance checks, service technicians perform a variety of other repairs. • They diagnose electrical problems and adjust or replace defective components. • They also disassemble and repair undercarriages and track assemblies. • They weld broken equipment frames and structural parts, using electric or gas welders.	track of problems and the state equipment is in, will be reflected in the running costs of such a farm or operation.

IDENTIFY THE RELEVANT DATA

It is important that the learner should be able to identify the data relevant to satisfy his/her objective.

The data collected should be collated – grouped and interpreted and the relevant numbers should be considered to satisfy the objective.

Example:

For the control of **aphids** on cotton, aphids are counted on 3 leaves per plant (bottom, middle and in the upper plant parts) and on 24 plants per field. Aphids in excess of 30 aphids per leaf are considered as highly relevant and as a high infestation. Aphids are therefore not counted as individuals but when more then 30 occurs per leaf surface counted, the plant is considered as being infested. When however, a small number of aphids are present, that is less than 30 in total on three leaves counted, they are considered as having little effect on the plant. When more than 12 plants out of the 24 plants scouted have more than 30 aphids (as a total of 3 leaves) this data is relevant for indicating a possible decision that should be taken to spray for aphids. When fewer than 12 plants with more than 30 aphids are recorded, this data is irrelevant, and one should rely on the natural enemies of aphids to suppress these numbers.

Consider the following points to make sure you understand:

Issue	Explanation
How do I decide when data is rendered relevant?	It depends on my objective, for what I would like to use the data
What do you do with data not required but recorded?	Do not discard; since recorded data can many a times explain an occurrence, such as variation in temperatures over time, although, you might require just averages of temperatures. Do not mention the irrelative data in your report but keep on record on a data sheet.

You need to count and add data correctly in order to collate data. They way in which you handle data will often determine if it is relevant or not. Should averages of data e.g. rainfall is required, it is important to calculate the total correctly divided by the number of days, or months.

For pest data gathered on a specific crop during scouting, it is important to keep track of the number of plants scouted, when determining the threshold for the specific crop. The number of pests observed or recordings of a particular pest made is also important.

GROUP ACTIVITY: Discuss in a group possible problems that may occur in your datasheet and discuss with the group leader:

Look at the following examples, and identify possible problems with the integrity of the data that has been collected. Write down what you think is incorrect, what you could do to correct it and where you can source the correct information.

1.

Daily Minimum & Maximum Temperature			
January		Minimum	Maximum
Date	Day	Degrees Celsius	
1	Sun	16	32
2	Mon	14	30
3	Mon	14	27
4	Tue	15	27
5	Wed	12	0
6	Thur	8	24
7	Fri	0	0
8	Sun	0	0
9	Mon	13	29
10	Tue	17	33

Incorrect: .....

How will I correct it: .....?

Sources to be used: .....

2.

Yield Records (Weight in kg e.g. Seed cotton)

			Income received @ R2.20 per kg	Input per ha (@ average of R2500)	Nett profit
Field	**Numbers of ha planted**	**Kg harvested**			
A	1	2 000			
B	2	1 500			
C	0.5	5 000			
D	4	6 000			

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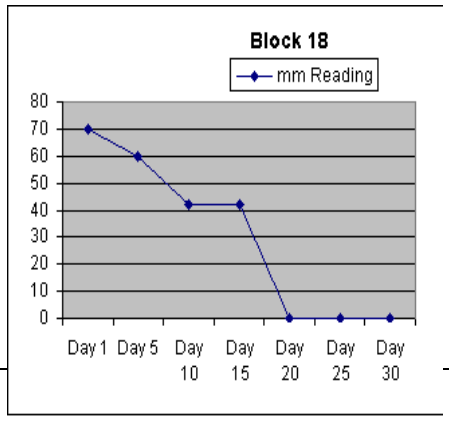
3.

Tensiometer Reading	
Block 18	
Date	**Mm Reading**
Day 1	70
Day 5	60
Day 10	50



Day 15	42	
Day 20	0	
Day 25	0	
Day 30	0	
Total per month	**204**	

1. Why we should collect data accurately?

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2. How can we ensure that the data that we collect remains accurate?

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RECORD COLLATED DATA AND CREATE A REPORT

DATE REPORTING EQUIPMENT

There are various basic tools and pieces of equipment that will assist the person who is completing data collection tasks. Let's look at some examples of these recording tools and what they are specifically used for.

<table>
<tr><th>Tool / Equipment</th><th>What it is used for</th><th>Tool / Equipment</th></tr>
<tr><td>Pen and paper</td><td>All recording, graphs, plotting and written information.

e.g. scouting tool = pegboard for pests on cotton</td><td>Filing and storage of all material and equipment should be in a secure and structured place.

e.g. Information is stored on a recording sheet</td></tr>
<tr><td>Pegboard</td><td>  </td><td>Pegboard recording sheet

Date: _____ Farm: _____

<table>
<tr><th></th><th>>30/3 leaves</th><th>>3/3 leaves</th><th>> or = 6</th><th>> or = 6 groups</th><th>Natural</th></tr>
<tr><th>Plants</th><th>Aphids</th><th>Jassids</th><th>Bollworms</th><th>Stinkbugs</th><th>Enemies</th></tr>
<tr><td>1</td><td>O</td><td>O</td><td></td><td></td><td>O</td></tr>
<tr><td>2</td><td>O</td><td></td><td></td><td></td><td>O</td></tr>
<tr><td>3</td><td>O</td><td>O</td><td></td><td></td><td>O</td></tr>
<tr><td>4</td><td></td><td></td><td>O</td><td>O</td><td>O</td></tr>
<tr><td>5</td><td>O</td><td>O</td><td></td><td></td><td>O</td></tr>
<tr><td>6</td><td></td><td></td><td></td><td></td><td>O</td></tr>
<tr><td>7</td><td>O</td><td>O</td><td></td><td></td><td>O</td></tr>
<tr><td>8</td><td></td><td></td><td>O</td><td>O</td><td>O</td></tr>
</table>
</td></tr>
</table>

		9 O O O 10 O 11 O O O 12 O O O 13 O O O 14 O 15 O O O 16 O O O 17 O O O 18 O 19 O O O 20 O O O 21 O O O 22 O 23 O O O 24 O O O O
Voice recorders	Digital voice recorders let you record memos, meetings, and phone conversations, as well as any information that you might want to store for data compilation.	Unlike tape recorders, Voice recordings are stored in.wma, .wav, and other formats. You can listen to the files on the recorder itself or transfer them to your Personal Computer for playback, archiving, and sending to others as e-mail attachments. Depending on the recording device, you can even use voice recognition software to transcribe your recordings into text, though the results can be spotty.
Electronic tools	These include equipment such as: Tensiometers, Oscilloscopes, Global Positioning systems, Bar-codes scanners,	Each piece of electronic equipment has a very specific and scientific function and should be stored, repaired and cleaned as prescribe by the manufacturer. We will look at their uses in more detail at higher level of this learning.

	computers and many more, Electronic scales, data loggers etc.	
GIS	*"In the strictest sense, a GIS (Geographic Information System) is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations. Practitioners also regard the total GIS as including operating personnel and the data that go into the system." The system is used for collecting and gathering agricultural data – geographic. A person completing this unit standard (level 2) will collect this data and store or compile a master document with the data collected (should be computer literate).*	
Pin boards	Drawn up and framed on a backing board, it can be covered in glass or clear plastic, or be attached to a **pin board**. Use felt-tipped pens to **record** details (often in different colours)	Drawn up and framed on a backing board, it can be covered in glass or clear plastic, or be attached to a **pin board**. Use felt-tipped pens to **record** details (often in different colours).
Colour codes	Drawn up and framed on a backing board, it can be covered in glass or clear plastic, or be attached to a pin board. Use felt-tipped pens to record details (often in different colours)	

HEALTH AND SAFETY MEASURES APPLICABLE TO DATA COLLECTION

HEALTH AND SAFETY MEASURES REQUIRED TO THE SAFE COLLECTION OF DATA

PROTECTIVE CLOTHING AND GEAR

It is important to remember that during the application of some chemicals, or during the monitor of equipment, it might be required that workers wear respiratory gear and safety clothing. In this section, we will look at the manner in which protective gear and clothing must be maintained and how it is correctly utilised.

MAINTENANCE OF EQUIPMENT AND GEAR

All protective clothing and safety equipment must be in good condition at all times. Before protective clothing is utilised, the user must ensure that:

- ✓ All items are free of holes and tears to prevent penetration of the chemical onto undergarments or onto the skin.
- ✓ All items have been washed properly after previous use.
- ✓ All buttons, zippers or other fastenings are working well.
- ✓ Elastic used in clothing and facemasks are not perished or stretched out.
- ✓ Cartridges for respirators must be replaced on a regular basis in line with the manufacturer's specification.
- ✓ Where it is found that protective clothing is torn, or has perished in some way, it must be replaced.

UTILISATION OF EQUIPMENT AND GEAR

The use of protective clothing must be strictly enforced at all times. Each individual should have his or her own protective clothing and equipment that fits well and is properly maintained. Farmers or workers are advised to wear appropriate clothing when applying or mixing chemicals. These include glasses, gloves, boots, overall or jackets with long sleeves, long pants. Basic first aid principles are

advised on like clean water on hand to rinse eyes. Learners are not encouraged to apply first aid by encouraging drinking of any substance other than water but to contact a medical practitioner immediately.

Safety precautions do not end when the sampling application is complete. All equipment has to be cleaned, maintained and stored in good condition in preparation for future use.

Operators should change out of working clothes and bathe once spraying is complete. Work clothes should be washed.

Protective clothing like masks should be maintained. When a respiratory type is used which requires changing of filters – it should be maintained and changed as necessary. Masks, gloves and boots with overalls, should be worn as indicated by the workplace environment and as indicated by labels on chemicals (see pictograms on chemical labels).

- Do not eat, drink or smoke;
- Always wash hands and face before eating, drinking or smoking;
- Remove first boots, apron, shirt pants, respirator, and gloves.
- Wash clothes separately

PERSONNEL REGULATIONS, COMMUNICATION WITH WORKERS AND NON-AUTHORISED WORKERS

All workers must be fully trained in workplace safety regulations and these regulations should be enforced at all times. The regulations must include regulations regarding the conduct of personnel when handling samples and chemicals, being:

- No smoking, drinking or eating is allowed in the vicinity of where chemicals are mixed, applied or stored.
- No person that is under the influence of alcohol or other drugs is allowed to handle chemicals for whatever purpose under any circumstances.
- Safety regulations regarding the use of chemical application equipment.

- Regulations regarding proper utilisation of protective clothing and equipment.
- Regulations on how to handle chemicals safely.
- Prescriptive regulations on how chemical spills, leakages and other emergencies should be handled.

Instructions concerning the chemical to be used, the concentration to be used, the area to be sampled and type of sample coverage required must be given in writing on a daily basis and signed by the supervisor.

In the interest of safety, under no circumstances are any non-authorised workers allowed to handle or be associated with handling or application of chemicals.

SOIL AND WATER CONTAMINATION

Care should be taken when compiling data so that spray drift does not contaminate water sources, such as dams, streams, springs, etc, as this might contaminate samples and distort the data.

Filling points where chemicals are mixed and spray machine tanks filled should be situated at least 50m from any water source, including boreholes, and have a suitable drainage system, such as a French drain, that can safely drain away spilt chemicals and excess water.

CLIMATE CONDITIONS

The supervisor should take cognisance of the expected weather conditions for the day of the planned sampling application, using various media that are available, such as radio, television, websites, etc. This will assist in the planning for resource allocation for the following day. If rain is expected, delay the planned sampling until such time as the weather clears

Training aids that are used include transparencies and examples of labels on pesticide containers, information on the label, colour coding, pictogram's and associated safety precautions.

UNDERSTANDING THE LABELLING OF CHEMICALS

A learner being trained in the specific outcome of safety should have knowledge of the details on a label.

Explain the different classes of insecticides and herbicides and colour coding used on the labels.

Indicate the contact numbers on the labels of the supplier, and the emergency no., as well as the poison information centre.

Explain, EC, GR etc. different formulations – indicates safe use of these chemicals in the workplace for optimum results and to avoid undesired chemical effects.

The learner must take note of the coloration on the labels with the pictograms

- Familiarise yourself with pictograms and labels and danger symbols (crossbones and skull).
- Recognize the different formulations on the label.
- Acknowledge the contact details of the pesticide and herbicide manuals.

Safe use of chemicals (Safety Procedures)

Buy smart, only buy from an accredited dealer or sales person, not from a friend.

Follow the AVCASA manual for transportation, and storage (preferably concrete or brick, with ventilation.) Lock storage room. Do not keep with paraffin or other substances that is needed often. Do not use paraffin containers or cool drink bottles.

Discuss: entering of products to the body.

See that you are adequately protected by correct clothing (see above).

Disposal of containers:

Puncture and reduce in bulk or size, bury.

Don't burn PVC, but burn cardboard and paper.

Care and storage for chemicals are discussed:

Learners are advised on how to care for chemicals, where to store them, where to keep keys for store room and what containers to use. They are advised on label instructions and not to re-use containers or other containers.

DESIGNATED AREAS

Adequate signage (approved by the authorities) that is easy to observe should be placed in locations designated for a specific purpose. These signs must give a bold, concise message such as:

- Danger.
- No Entry.
- No smoking.
- No drinking and eating.
- Fire-extinguisher location.
- First Aid Equipment location.
- Emergency Exit.

These signs are either informative in nature or give a clear instruction in a manner that is understandable to all irrespective of their language.

Chemicals should only be mixed in areas designated for the purpose, such as at filling points. These areas should be clearly marked and unauthorised personnel should not be allowed into these areas while chemicals are being handled.

CHAPTER 6

FINANCIAL MANAGEMENT

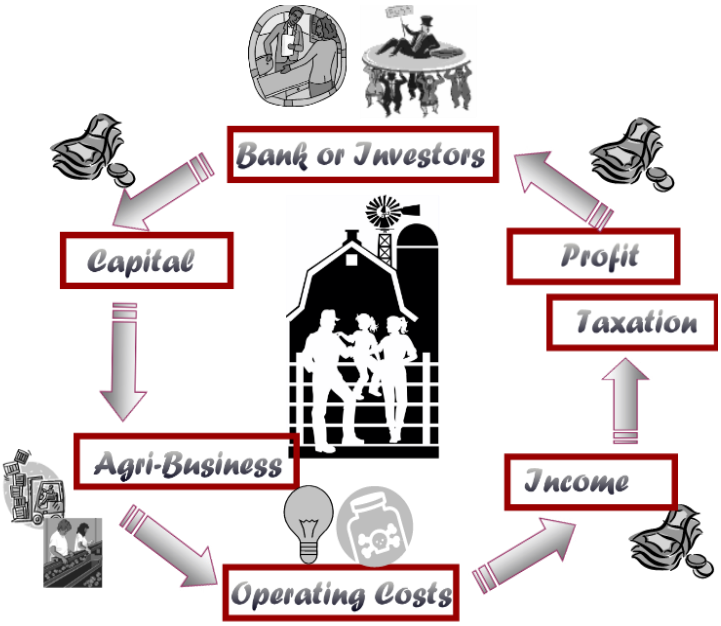
In this chapter we explore the following concepts:

- The flow of money in an Agri-business
- Where does the money/capital go to in an Agri-business?
- The flow of costs in an Agri-business
- Fixed costs.
- Variable costs.
- Indirect costs
- Direct costs
- Various sources of income generation
- Selling at a profit in Agri-business
- How to plan a profit?
- How to know when you are making of a profit
- Managerial information
- Elements of an income statement
- Elements of a balance sheet
- Balance sheet analysis
- Cash flow budget
- Need for 12-month cash flow budget

- Simple and compound interest
- Develop a financial plan
- Develop a Cash flow budget

THE FLOW OF MONEY IN AN AGRI-BUSINESS

Sources of income generation:



WHERE DOES THE MONEY/CAPITAL GO TO IN AN AGRI-BUSINESS?

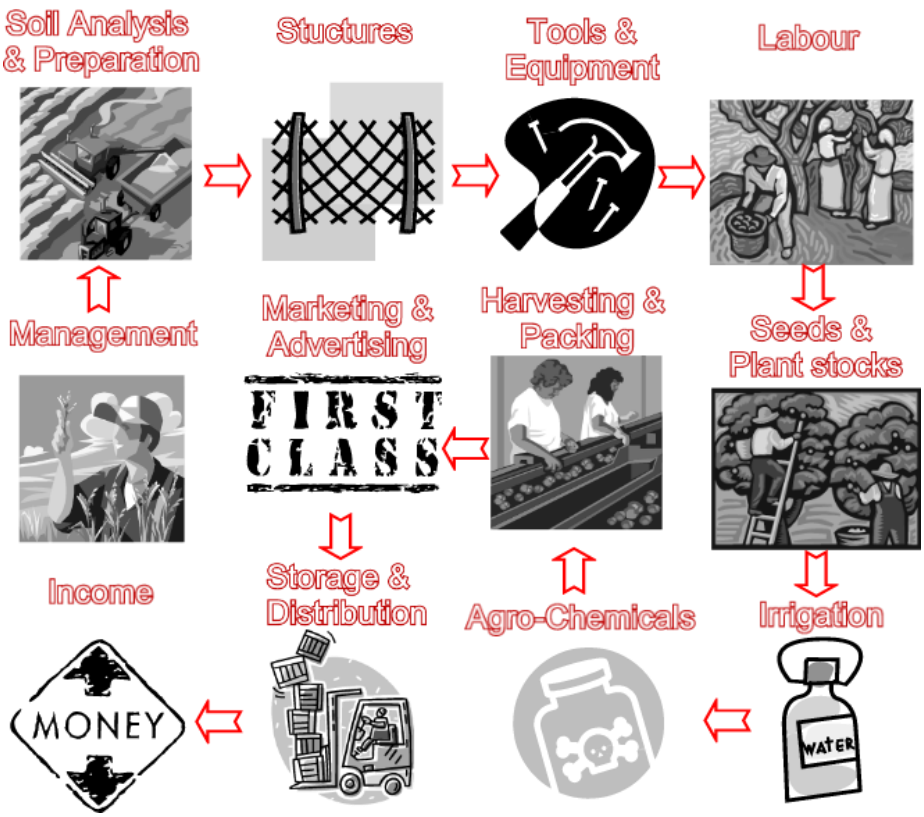
An Agri-business or farm will need money to pay for:

Land	Buildings
Machines	Loans
Labourers	Materials
Diesel, Oil, Maintenance	Commission to market agents
Office Supplies	Water and Electricity

We normally define the things we buy as follows:

Assets	Operating costs
• Assets are those things that you have to buy in order to produce, e.g. land, buildings, machines. • Assets are things you can re-sell. • Assets are usually expensive. • Assets are not bought regularly.	*(Operating costs are those things that are bought regularly (e.g. monthly or quarterly) to produce a crop)* • Materials. • Diesel, Oil, maintenance. • Commission to the market agents. • Office supplies. • Water and electricity.

THE FLOW OF COSTS IN AN AGRI-BUSINESS



GROSS MARGIN STATEMENT

In order to run a farm enterprise one has to incur costs i.e. one has to buy farming requirements, and also pay for services rendered. Costs can be classified as direct costs, indirect costs, fixed and variable costs.

Fixed costs

Fixed costs are those costs, which cannot easily be allocated to the different enterprises or parts that make up the whole of the farm. These costs include transport, the monthly electricity account and rental or purchase payments. These costs are relevant to the farm as a whole. Fixed costs do not change if the size of the farming enterprise changes. **Fixed costs** will have to be paid continuously even if no production occurs.

These costs include:

- Depreciation in the value of vehicles and machinery
- Insurance premiums on fixed assets such as buildings and machinery
- Licenses
- Permanent labour
- Monthly payments for the property if money is still owed.
- Others

Variable costs

Variable costs are costs, which can be allocated to each individual section of the farming enterprise. These are costs that are needed for production, and will only be incurred when production takes place. Variable costs will change as the size of farming enterprise is changes.

Variable costs are costs that vary with the extent of production of outputs. When output increases, more labour is needed, more irrigation may be required and more fertilizer will be used. If the enterprise reduces, production costs will also reduce. The total variable costs increases as output increases and falls as output decreases.

Variable costs include, but are not limited to the following:

- Seed to plant crops
- Purchases such as fertilizers, chemicals
- Marketing costs such as packaging, materials
- Casual labour
- Transport
- Irrigation costs for field crops

Indirect costs

Indirect costs are those costs that are essential for the daily running of a business. They are also known as overheads or fixed costs as they remain the same irrespective of the extent of production. Included in these costs are rent, interest payments, electricity and water, municipal rates and taxes, communication costs and management costs.

Direct costs

Direct costs are those costs that are directly linked with the production of a crop. They are also called variable costs as they vary with the output. They would include materials (fertilizer, seed) and wages paid to temporary labour.

VARIOUS SOURCES OF INCOME GENERATION

Income – is the profit, earnings or returns received

Sources of Income

The sources of income for agri- business are very broad, but can be grouped into the following three categories:

- Income from crops.
- Income from livestock.
- Income from sundry farm activities.

Income from livestock

- Livestock sales - animals sold to markets.
- Livestock slaughtered for home consumption.
- Insurance received from livestock losses.

Income from sundry farm activities

- Income derived from contract work with existing surplus capacity.
- Bonus on turnover.
- Farm products sold which is difficult to allocate or of minor importance.
- Farm products sold which derive from the major source of income, e.g. eggs or milk.
- Sundry income from hiring out veld.
- Income from selling homegrown materials e.g. hay.
- Income from eco-tourism if it is a sideline.
- Sundry income from a fodder crop.
- The farmer selling his skills, such as survey or construction.
- Sale of indigenous seed, plants etc.

From the list above it is obvious that there are many different forms of income generating on a farm. It is very important to determine the demand for various products. It is foolish to produce a vast quantity of a product if there is no demand for it. This would result in a loss of time and inputs that were invested in the product. Supplying a product depends on its demand; it is therefore possible to create the demand by following a marketing strategy.

Agri-business is normally a seasonal business. It sometimes takes a few years or seasons for a farm or agri-business to produce the product that it set out to produce.

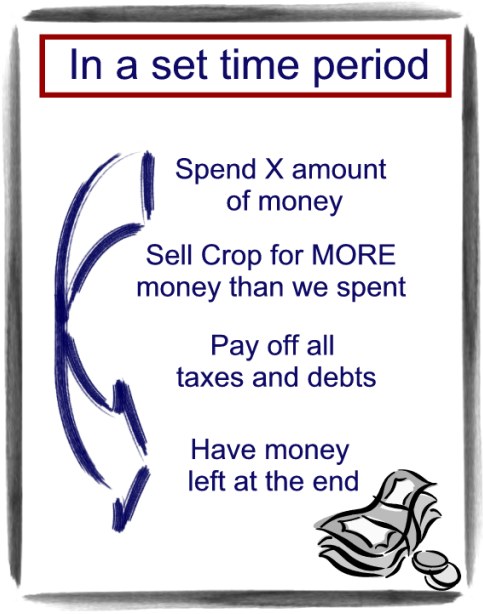
However – there are "inputs" needed through the growth cycle. It is thus very important to plan very carefully – so that you make sure that when you eventually start making a profit that you also

recoup all the accumulative expenses that you had previously incurred!

SELLING AT A PROFIT IN AGRI-BUSINESS

What does "selling at a profit" mean?

It means that we have gained more money at the end of a set period of time by producing a crop, than we used in the same period of time.



A loss is when the business:

- Spends more money than it earns.
- There is a shortage because expenditure exceeds income.
- The business is going backwards and is starting to lose money.
- If a business continuously makes a loss; there is a chance that it can go bankrupt.

Break-even is when the business:

- Income equals the expenses.
- Stands still and does not move forward.

- If anything should happen that would cause the business to have unforeseen expenses, it might put the business at risk of making a loss.

Profit is when the business:

- Income is bigger than its expenses.
- More money comes in than is spent.
- The business can pay all its expenses and there is still money left over.
- The business is going forward and will keep growing.

HOW TO PLAN FOR A PROFIT

Good financial planning involves constant planning around the building and protection of your assets and cash flow, for every phase of the agri-business' production cycle.

Financial planning revolves largely around when and where you spend your money, with the aim that you and your employees and shareholders will get the maximum long term benefits from your assets, and from operating this type of business.

Thorough planning is the only logical way to survive in today's fast moving world.

Financial planning entails thorough analysis and revision of all aspects of a business' financial affairs and the preparation of personalised and comprehensive plans for that same business to achieve long-term financial security and growth.

You can make your money stretch if you:
• Know what you want to do with your money.
• Know where your money goes.
• Know how to keep your money longer.
• Plan your spending in advance.
• Know and keep within your credit limits.

HOW TO KNOW WHEN YOU ARE MAKING PROFIT

To calculate whether you are making a profit or loss:

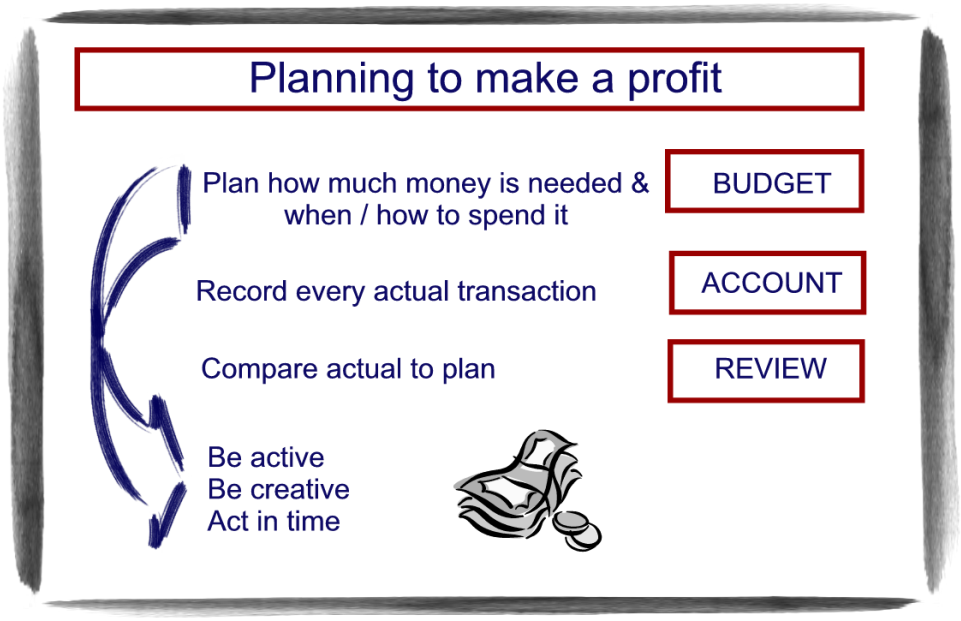
MONEY AT THE BEGINNING - EXPENSES

\+ THE INCOME THAT YOU MADE FROM SELLING YOUR PRODUCE

= PROFIT (IF YOU END UP WITH A POSITIVE FIGURE)

OR

= LOSS (IF YOU END UP WITH A NEGATIVE FIGURE)



MANAGERIAL INFORMATION FROM RECORDKEEPING SYSTEM IN AN AGRI-BUSINESS

All the records that a business keeps are important information that is used to analyse the state of the agri-business. It is important to read and understand the information that is given in these reports. It will assist the owner to make decisions about the business.

Management will use the information recorded in the system to make important further business decisions. The management might want to know on a monthly and yearly basis if the business is making a profit. The management also wants to know if the assets and owner equity is growing year after year. The business management uses records to make the following decisions:

- Is the business profitable?
- Is the business growing?
- Where can we save on costs in the business?
- What can we do to maximise our income opportunities?
- What can we change in the future in order for our business to be more profitable?

THE GROSS MARGIN

Definition:

The **Gross margin** is defined as the amount that can be calculated by the difference between enterprise gross value of the product (Gross income) and the directly allocated variable costs.

Example:

- A financial budget for cotton can be calculated if the following is known:
- Field size of the crop (cotton), the estimated yield and the crop value per ton or per kg. If one assumes that you would get R3.10 per kg seed cotton, and all input costs adds up to a total of R5.561, then the Gross income would be R9300 @ 300kg per ha, (calculated at the above price of R3.10 per kg) and the Gross margin would be the difference between the Gross income and the input costs.

In this case an amount of R3 739.00.

THE INCOME STATEMENT

ELEMENTS OF THE INCOME STATEMENT

Farm Income

Refers to those items that represent the income of the farm business.

Farm Expenditure

Refers to the costs of operating a farm business. Some of the items can be allocated to the specific production enterprise and some cannot. Allocated costs include seeds, fertilizers, feeds, labour costs etc… Non-allocated costs (overhead costs) include permanent labour wage, telephone, fuel, repairs, electricity etc.

Net Farm Income

The net farm income is the income the farm generates after overheads have been deducted. It is calculated by deducting overheads from the total farm gross margin.

Net farm income provides a measure of performance and factors of production including management, capital and land.

Farm Profit

This is the income that remains after all costs have been deducted.

This is calculated by deducting external factor costs from the net farm income. The farm profit is a measurement of the return or reward to the owner, management, capital and land.

SCHEMATIC DIAGRAM OF INFORMATION FLOW IN A FARM INCOME STATEMENT

TOTAL FARM MARGIN	
Overhead costs	Including payment to management, interest on capital and lease or rental on land; electricity, water,
Variable costs	Fuel, oil, and lubricants Repairs and spares for vehicle and machinery Variable costs in respect of sundry farm income Others
Fixed costs	Depreciation on vehicle and machinery Insurance on fixed improvement, vehicle and machinery Licenses Regular labour, Repairs for fixed improvements. Others

Net Farm Income
↓
External Factor cost
↓
Farm Profit

THE BALANCE SHEET

INTRODUCTION

A balance sheet is a statement summarizing the assets and liabilities of a business at a particular point in time. This time is usually at the end of the financial year. The primary function of a balance sheet is to measure the financial solvency of a business as it indicates the extent to
which the assets match to the liability.

ELEMENTS OF THE BALANCE SHEET

A balance sheet is made up of three aspects: capital, assets and liabilities. These three are related to one another as shown in the equation below:

Capital = assets – liability

Or

Assets = capital + liability

It is important to recognize that **assets** and **liabilities** are usually grouped according to their lifespan as follows:

Short-term/current

Medium term

Long-term

They have a strong impact on the results of financial analyses of a business.

BALANCE SHEET ANALYSIS

Balance sheets are used to establish the financial strength or weakness of the business concern. Furthermore, they are used to establish trends from historical information contained in the balance sheet.

Financial Ratio Analysis is used to gain overall financial view of a farm business as well as indicating financial progress.

Financial ratios are classified according to the following:

- Solvency
- Liquidity
- Growth

Definition:

Solvency refers to the business's ability to meet its long-term obligations if it does not go bankrupt.

Liquidity measures the business's ability to continuously generate sufficient cash to meet its financial commitments. A decrease in liquidity will render the farm business unable to meet its short-term requirements, continue operations and expand. A business's cash in the bank is referred to as a liquid asset.

Growth of a business or farming venture is measured by the change in value of the business from one financial period to the next.

Assets - are economic resources that can provide potential service in the future. These are divided into non-concurrent assets that would include property, plant and equipment. In addition there will be current assets, sometimes referred to as liquid assets, which includes the debtors and other receivables payments, bank balances and cash.

Short-term assets -current assets that management could convert to cash within the year (cash, receivables, stock)

Medium term assets – intermediate assets that would take longer than a year, but shorter than five years to convert to cash. Includes investments that have a set time frame to them - policies or actual intellectual property (work that can be patented but takes time).

Long-term assets - fixed assets like machinery, land, buildings, motor vehicles, computers, furniture and fixtures.

Liabilities - are obligations that the owner must pay to other parties such as creditors, employees

Short term liabilities - current liabilities- these are amounts that must be paid within a year. - Salaries and wages, taxes, short-term loans, money owed to suppliers of goods and services.

Medium term liabilities - are amounts owed on contract work carried out on research that does not have a specified time limit, but will be paid for when the project is complete.

Long-term liabilities - these are debts that are due on long-term (more than one year) loans (mortgage) from the Land Bank. These are bank bonds on farmland and infrastructure, machinery and plants that are paid off over twenty years.

Owners' equity is the amount owed to the owner after the liabilities have been deducted. - For example, if the owner of a farm is worth R30 000 000 and owes the bank R20 000 000, you would subtract the amount owed on the farm from the owner's capital worthiness. This renders the owners' equity which would be R10 000 000. If the farm is a closed-corporation, the amount owing to the members' share after all amounts are deducted which is owed on the farm and other liabilities, is called the employees' own.

THE CASH FLOW BUDGET AND STATEMENT

INTRODUCTION TO THE CASH FLOW BUDGET

Cash flow is the money needed to run your company on a day-to-day basis. This is the money available after all the expected expenses have been covered, for unexpected expenses.

Cash flow statements are a tool that reflects the sources from which funds are generated during the accounting period as well as the purpose for which these were used.

The cash flow statements must be compiled for one year or at least until positive cash flow is achieved if not attained within the first year.

The most important feature of a cash flow budget is that only cash expenses and cash income are indicated at the estimated time of payment or receipt.

The cash flow statement reflects the source from which funds were generated during the accounting period. Cash flow is an important consideration when it comes to financing a business. The bank and monthly bank balance are important elements of a cash flow statement. A cash flow statement consists of three components: income, expenditure and bank balance.

Income consists of operating income, capital income and cash income.

Expenditure is classified as operating expenditure, capital expenditure and debt repayment.

Shortfall/surplus is calculated by deducting total expenditure from the total income.

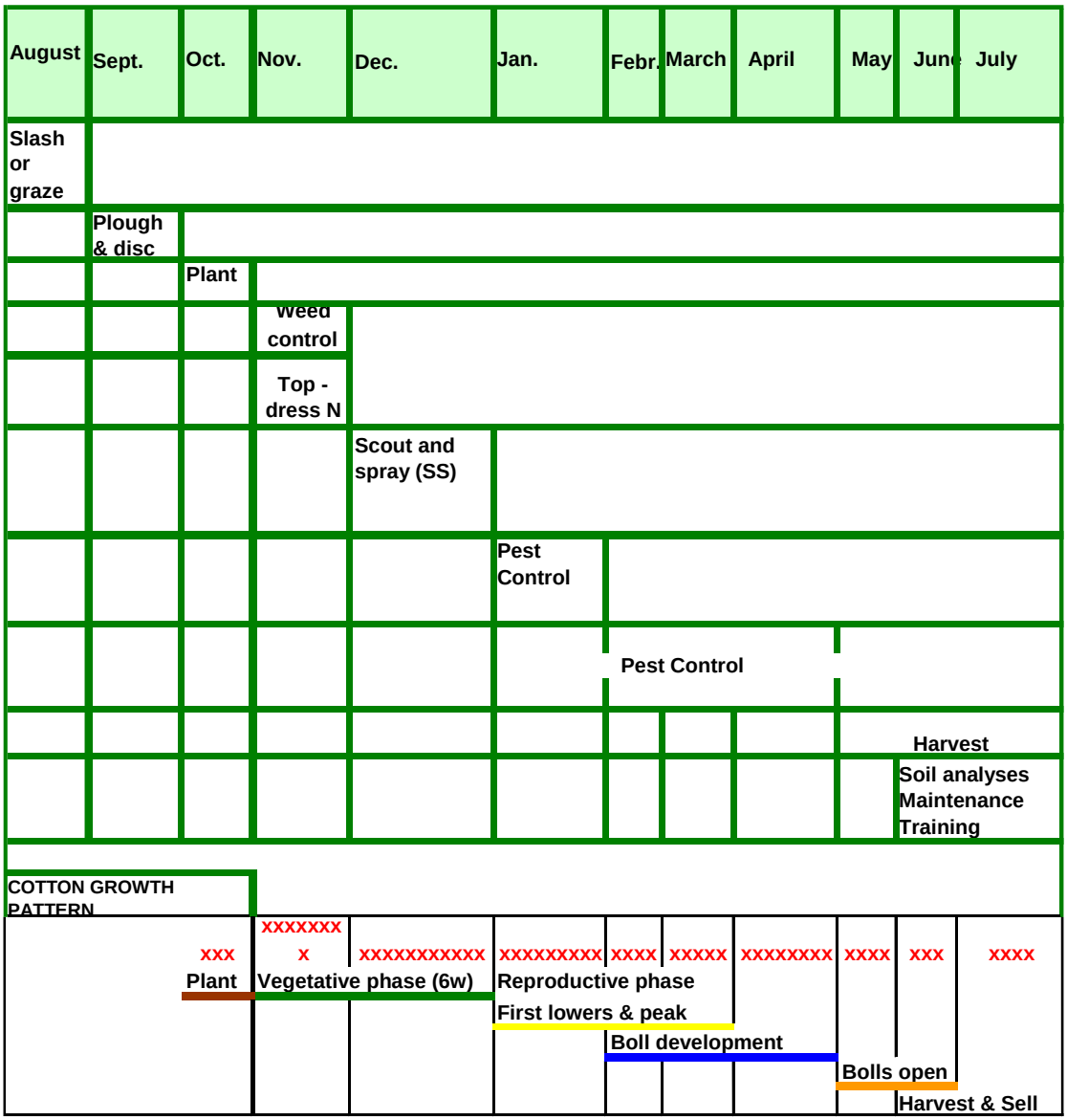
The various components of a cash flow budget statement are:

Opening cash balance	Farm Income
	Capital income
	Nonfarm Income
Farm Operating Expenses	Fertilizers
	Leases or rental
	Sprays
	Wages
	Repairs
Capital expenditure	Machinery
	Livestock
Other expenditures	Income statement
	Living wages
Scheduled debt payment	Interest
	Redemption
	Total cash outflow
	Closing cash balance

THE NEED FOR THE TWELVE MONTH CASH FLOW BUDGET

In order to understand a cash flow budget it is necessary for a farmer to understand which activities take place during the season, and the associated costs to complete these activities successful. For example, cotton is a cash crop. In order to set up a cash flow budget the farmer must have a cultivation programme in place as the crop will need attention (insecticides, fertilizers, picking, ext.) at different growing stages, and therefore, cash must be available for every event according to the programme arranged beforehand.

EXAMPLE:



A CRITICAL PATHWAY OF ACTIVITIES FOR COTTON PRODUCTION

The farmer should have a good knowledge of:

i. Length of the crop season.

ii. In which months every activity should take place to produce the crop.

iii. Plant development for each crop cultivated should be clear, in order to express good pest control, and optimum yields.

iv. The farmer should set up an outline of the crop size he would like to produce.

v. He/she should be able to recognize the infrastructure available

vi. Which inputs are needed, financially and support services.

vii. Have a clear comprehension of the available workforce (labour)

viii. When a critical programme has been drawn up as above, the learner can compile cash flow statements. These are probably the most important aspect of the financial management of a farming business. Many farming based businesses currently experience cash flow related problems. A 12-month cash flow budget predicts an estimate of cash needed for a year.

EXPENDITURE/CASH OUTFLOW	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	***Sep***	**Oct**	**Nov**	**Dec**	**Total**
Office lease	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500	**18 000**
Traveling expenses	-	5 000	-	-	-	-	-	-	-	-	-	-	**5 000**
Training Equipments	-	3 500	-	-	-	-	-	-	-	-	-	-	**3 500**
Vehicle costs	30 000		-	-	-	-	-	-	-	-	-	-	**30 000**
Stationery	1 200	-	-	-	-	1 200	-	-	-	-	-	-	**2 400**
Admin costs	100	50	30	40	30	50	40	30	20	40	50	30	**510**
Telephone cost	500	450	300	250	500	250	200	250	100	250	150	100	**3 300**
Electricity	150	200	250	180	150	280	200	250	150	200	100	250	**2 360**
TOTAL EXPENDITURE	**33 450**	**10 700**	**2 080**	**1 970**	**2 180**	**3 280**	**1 940**	**2 030**	**1 770**	**1 990**	**1 800**	**1 880**	**65 070**
ACCUMULATED DEFICIT	**33 450**	**10 700**	**2 080**	**1 970**	**2 180**	**3 280**	**1 940**	**2 030**	**1 770**	**1 990**	**1 800**	**1 880**	**65 070**

- A Cash flow budget is a budget that breaks the yearly cash flow into twelve-month segments. This allows for greater control of the flow of cash.

- A cash flow statement presents the source and use of the funds of the enterprise according to operating activities, investing activities and financing activities.

- Operating activities describes the cash received for the product and cash payments made for production costs.

- Investing activities describes the purchasing of new equipment or expanding the operation.

- Financing activities describes the repayment of long-term loans.

Example:

Cash flow table for cotton production												
Item:	**Aug**	**Sept**	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**April**	**May**	**June**	**July**
Plough		300.00										
Disc			200.00									
Seed			70.00									
Plant (Hand)			195.00									
Roundup			65.00	65.00								
Fertilizer LAN					95.00							
Labour weeding				35.00				35.00				
Labour spraying			35.00	35.00				35.00	35.00			
Jassid control (Mospilan)								60.00	30.00			
Stainer control (Fastac)								21.00	22.00			
Harvest										250.00	250.00	
Total:		**300.00**	**565.00**	**135.00**	**95.00**			**151.00**	**87.00**	**250.00**	**250.00**	
Cumulative		300.00	865.00	1,000.00	1,095.00			1,246.00	1,332.00	1,582.00	1,832.00	
Loan plus interest (13.5% comp.)		303.00	878.00	1,025.00	1,132.00	1,145.00	1,158.00	1,324.00	1,425.00	1,694.00	1,966.00	
Income:										1,550.00	1,550.00	

USE SIMPLE AND COMPOUND INTEREST

INTEREST

There are two ways of calculating interest. It is either simple interest or compound interest.

❖ Simple interest

Simple interest is interest that is earned on an amount over a long period and calculated at the end of the period only.

Example:

Joseph puts R 1 000-00 into a fixed deposit account at the bank. The interest he earns will be a fixed interest of 12% per year (p.a. is the official abbreviation for per year and it comes from the latin words per annum).

After 12 months (one year) Joseph can expect his investment to have grown

as follows:

R1,000-00 @ 12% interest p.a.= R1,120-00

The following **formula for simple interest** can be compiled: Where

P = Principal Amount
n = time in years
I = rate in percentage per annum

Simple interest

$$A = P(1+i.n)$$

From Joseph's example we can see that:

The principal amount (P) is R 1 000-00

The time in years (n) is 1

The rate in percentage per annum (i) is 12

To apply the formula, we simply substitute the figures in the correct places:

Simple Interest = P(1+i.n)

= 1 000 (1 + 12 (1))

= 120

The Increased value of an investment is called the Amount, and is calculated by adding the interest to the amount that was invested (Principal)

Amount = Principal + Interest

In Joseph's case, the formula s applied as follows:

Amount = Principal + Interest

= 1 000-00 + 120

= 1 120

If Joseph invested the R1 000-00 for a period of 5 years, with the interest of 12% only payable at the end of the five years, his investment would have grown as follows:

The principal amount (P) is R 1 000-00

The time in years (n) is 5

The rate in percentage per annum (i) is 12

To apply the formula, we simply substitute the figures in the correct places.

Simple Interest	**=**	**P (1 + (i) (n))**
	=	1000 (1 + 12(5)/100)
	=	1000 x 0.12 x 5
	=	1000 x 0,6
	=	600
Amount	=	Principal + Interest
	=	1000-00 + 600
	=	1600

Compound Interest

Compound interest is interest that is earned on an amount over a longer or shorter period and calculated daily, weekly or monthly. This interest is then paid into the account and used to calculate the following day, week or month's interest. In short, compound interest is interest earned on an amount plus its interest.

Compounding rands

I gave my daughter a Ziploc bag with a handful of rand and told her over the course of a week I wanted her to give me one rand a day. For the next seven days I would be her personal banker. I would deposit the rand in "**The bank of Dad**" and compound interest would begin to accrue the day she had deposit the rand. At the end of the week we would check her balance at the "**ATM**" (**A**utomated **T**ell –me-how-much-money-my dad-has for me **M**achine).

Each day my daughter handed over a rand at the breakfast table and I deposited one in her bank- which is really an old can fruit bottle. I gave her a "receipt" for her deposit and explain that she needs to keep up with the receipts to see how much money she has added to her account. In an effort to make this little more realistic, I deposited a rand from my own piggy bank every other day to give her an additional four Rand at the end of the week. I could have just matched her rand for

rand, but didn't want to set the unreal expectation that it is easy to double your money in a short time.

Balance Enquiry

On Sunday evening we gathered receipts and confirmed she had deposit seven rand in " The Dad Bank" I asked her how much money that represented, and she correctly told me," Seven Rand". Using That ATM, she is familiar with, she performed a balance enquiry. I opened the can fruit container and counted out its contents- all eleven pennies. "Hey**, there are four rand extra in here!"**

Yes! She got it! I explained that her original seven rand had grown to eleven rand because every couple days the bank paid her a rand for letting them use her money-that's interest. I gave her back all the money and told her to put it into a savings envelope and to go and save it in the bank.

The Compound interest formula is:

$$A = P(1 + r/100)^n$$

Where: **A** is the amount or total value of the investment after a certain period

P is the principal that is invested at the beginning of the period

i is the rate in percentage per annum*

n is the number of periods, not necessarily years*

Should precious want to invest this R 1 000-00 over a five-year period, her investment will grow to the following amount:

A = Total value of the investment after 5 years

P = The principal amount of **R 1 000-00**

r = The rate for 5 years i.e. **12% per annum**

n = Number of periods in 5 years i.e. 5(years) x 12 (months)

= 60 periods

$$A = P(1+r/100)^n$$

$$= 1\,000(1 + 1{,}12)^{60}$$

$$= 1\,000(1{,}12)^{60}$$

= 1 000 x 1,1268247

= 1 126,8247

= 1 126,83

Interest = A - P

= 1 126,83 - 1 000

= 126,83

.Example 1:

Richard invests R500 for 3 years at a rate of 8% per annum. Interest is compounded annually.

Value of the investment at the end of the 1st year: 8/100 x R500

=R35

At the end of year 1 = R 500 + R35

=R 535

Value of the investment at the end of the 2ndyear: 8/100 x R535

=R42.80

At the end of year 2 = R 535 + R42.80

=R 577.80

Value of the investment at the end of the 3rd year: 8/100 x R 577.80

= 46.22

At the end of year 3 = R 577.80 + R46.22

=R 624.02

Total compound interest after 3 years = R 624.02 – R 500

= R 124.02

Compare this to simple interest rates: R 500X 8/100X 3years

=R 120.00

Example 2:
R1000 is invested at 8% p.a. compounded annually. Calculate the value of the investment at the end of six years.

Solution
Compounded annually means that the interest is added to the capital at the end of each year.

Value of the investment at the first year: R 1000x8/100

= R80

At the end of year 1= R1000 + R80

=R1080

Value of the investment at the 2nd year: R 1080x8/100

= R86.40

At the end of year 2= R1080 + R86.40

=R1166.40

Value of the investment at the 3rd year: R 1166.40x 8/100

= R93.31

At the end of year 3= R1166.40 + R93.31

=R1259.71

End of the 4th year: 1259, 71 +0.08 (1259.71) = R 1 360.49

End of the 5th year: 1360.49 +0.08 (1360.49) = R 1 469.33

End of the 6th year: 1469.33 +0.08 (1469.33) = R 1 586.87

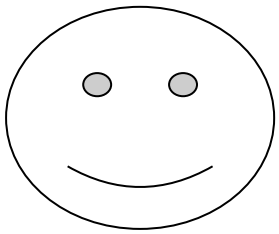
Interest over six years = R 1 586.87 -R 1000 = 586.87

Compare to simple interest over the same period.

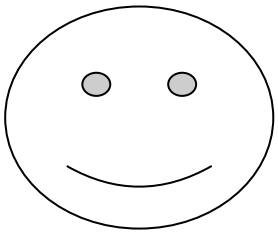
A = P(1 +i.n)

= 1000 (1+0,08x 6)

= R1 480



So compound interest is a better option over long periods of time



You will notice after 6 years of compound interest, the amount saved is R1 586.87, compared to only R1 480 using simple interest

SITUATIONS AFFECTED BY FINANCIAL TRENDS

Investments

Money that is put away into a savings scheme so that it can:

- ✓ Grow and become more than the original amount
- ✓ Earn interest so that the money grows

An investment can be for a:

- Short term = less than 6 months
- Medium term = 6 to 36 months
- Long term = more than 36 months

The basic principle for any investment is: "the higher the return, the higher the risk'

What this means is that the more interest they promise you on an investment, the higher the risk is for you (the investor) to invest your money.

A good example of a risky investment would be if you invest money in the stock market i.e. buying and selling shares. If you do not know what is going on, when to buy, when to sell, you could end up losing all your money. However, if you know what is going on in the stock market and you can 'read between the lines', you will make much more money than you invested.

Safer investments usually bear a lower interest rate. A fixed deposit is a good example of a safe investment. You know your money is going nowhere and it will still be there at the end of your investment period

Unit trusts are less risky, but they are a long-term investment. Unit trusts are offered by financial institutions that collect amounts of money from many people. These institutions employ people who know the stock market very well and they are called fund managers. These fund managers buy blue-chip (safe and stable) shares with this collective amount of money. The value of the shares is then equally distributed amongst the initial payers. When you 'sell' your unit trust back to the financial institution, your return on investment includes **dividends** and **interest**.

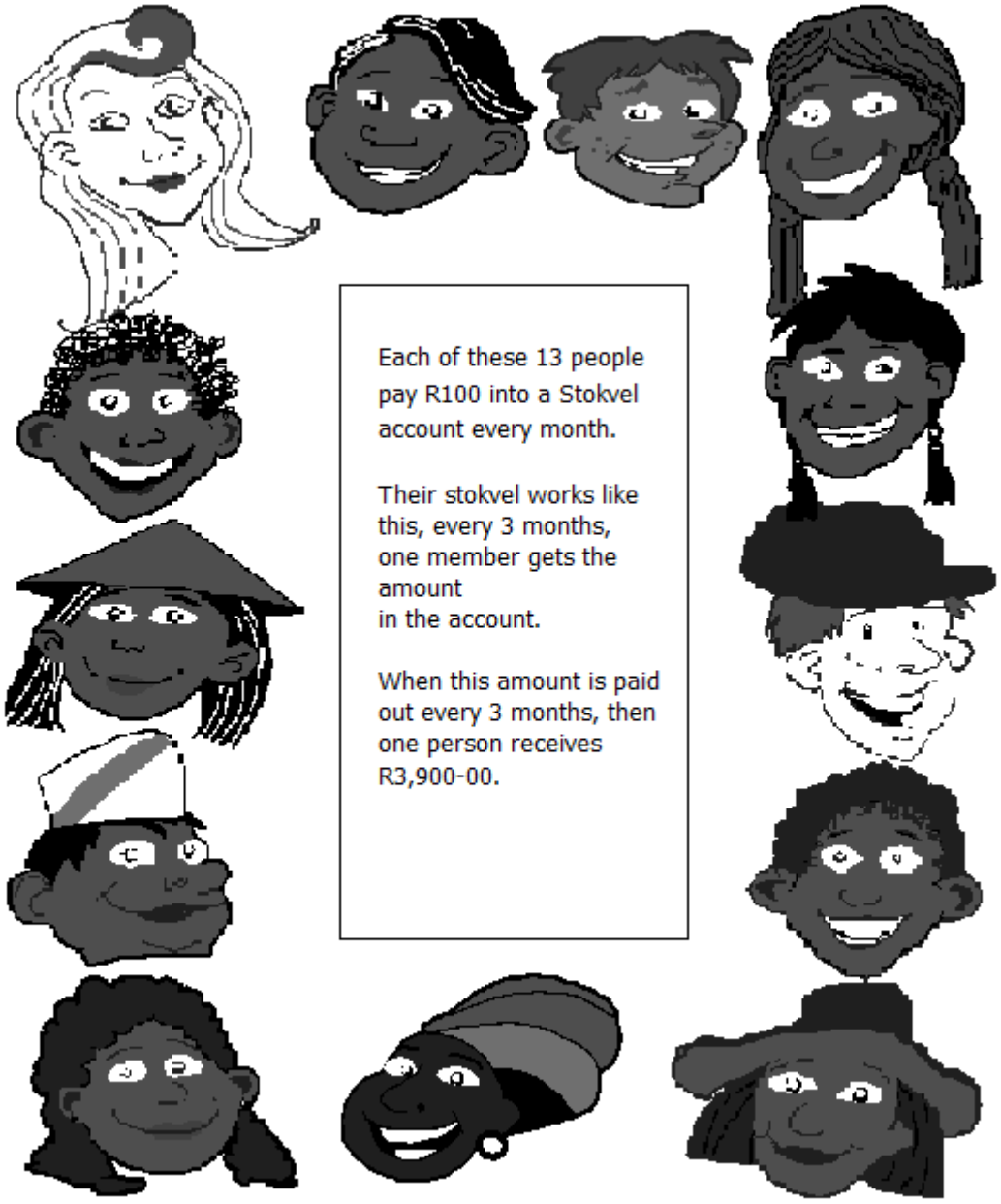
Dividends are money that is made from buying and selling the shares and **interest** is the return on the money that you invested.

Unit trusts can be up the one day and down the next, so you still need to be very careful about when you buy or sell. The rule is to buy when the stock market is down and sell when it is up. Timing is very important.

Stokvels

A stokvel is usually when a number of people get together and 'club' together their money. Every member of the stokvel receives the money at a particular time.

Because a number of people contribute, the money and interest accumulates more rapidly than if you were saving on your own.



Inflation

Inflation is the average change in prices over a period of time. We often hear what the inflation rate is when we listen to financial reports over the radio.

If our inflation rate is 15%, then it means that this time last year something that cost R100-00 will now cost you R100-00 + 15% = R115-00.

Inflation can be a vicious wealth killer.

Example:

- Piet works at Hummingbird Milling. Piet wastes a lot of mealiemeal every day, because he is not interested in his work. The company loses money. At the end of the year, they take a big knock for all Piet's wasting of mealiemeal. This means less profit. Less profit mean less money in the bank.
- Less money in the bank means less increase for staff. Less increase for staff means less comfort at home. Less comfort at home makes more miserable people. More miserable people become unhappier at work. Unhappy workers become less interested in what they do. Less interest becomes more waste.
- Hummingbird Milling knows all this and decides to put up the prices of their mealiemeal to compensate for Piet's lack of interest. They put the mealiemeal price up by R1-00. The stores that sell mealiemeal to the public have to put up their prices and they do so by making mealiemeal R2-00 more expensive.
- If this happens every day and everywhere, we will soon not be able to afford mealiemeal, just because of carelessness.

ASSETS

An asset is an item that you acquire and that has a fixed value.

Appreciation of Assets

Some things you buy can grow in value. When something grows in value after you bought it, it means that it appreciates or increases in value. The following assets usually increase in value after you have bought it:

Property - To work out how much an asset appreciates, we first determine what the growth rate for such an asset is, then we continue with working out its appreciated value.

Example:

Bheki has just bought a house for R500 000-00. He wants to know what this house will be worth in 5 years' time.
First he calls up a few local estate agents and asks by how many properties have increased in value in this particular suburb over the past 5 years.
He gets the following answers:

Agent 1:	10%
Agent 2:	20%
Agent 3:	15%
Agent 4:	12%
Agent 5:	9%

He works out the average:

(10 + 20 + 15 + 12 + 9) ÷ 5 = 66 ÷ 5
= 13.2%

Then he uses this average of 13,2% to work out the appreciation of his property in one year:

R500 000 x 13,2% = R66 000

Finally he calculates this by multiplying R66 000 by the nuber of years i.e. 5 years.

66 000 x 5 = R330 000

Appreciation of Property in 5 years = R500 000 + R330 000
= R830 000

Depreciation

Depreciation occurs more frequently than appreciation. Depreciation is anything that decreases in value. Good examples of things that depreciate are:

motor cars

cell phones

computers

machinery and equipment

At the end of each financial year, companies calculate the depreciation of an item.

There are two ways of calculating depreciation, namely

- a fixed percentage of the original value (fixed method)
- a fixed percentage of the yearly depreciation amount.

Note: We only deal with the fixed installment method.

Example:

Jack's Hardware has to present an account of the value of their assets (i.e. vehicles, furniture, etc.) in the business each year. After many years of experience, Peter, the bookkeeper knows that after a few years of using these items, they are worth nothing. Eventually, he writes them off. (Writing off means that something is worthless to the business).

Jack's Hardware has a bakkie which they use for deliveries. They paid R 120 000-00 for it. Usually they have to replace the bakkie every 5 years; otherwise it is more in the repair shop than on the road. That means it has depreciated at a rate of 20% per year (100% + 5 = 20%)

To work out the depreciation over 5 years, we start with working it out for the first year:

Depreciation per year = $^{10}/_{100} \times {}^{120000}/_{1}$

= R12 000.00

Then we work out the depreciation over 5 years.

Value after 5 years	=	R120 000 – (5 x 12 000)
	=	R120 000 – R60 000
	=	R60 000

FINANCIAL PLANNING

You now have enough background to develop your own financial plan and system for your farm. This will take time and is best done in a series of sessions back home. Put as much detail as possible to your plan and try and do accurate estimates – when required.

Follow the steps indicated below and use the My Farm Record Keeping Forms to record data.

Step 1: Estimate your income for the next year on current enterprises

Plan for income by using My Farm F2: Plan for Income

List all estimated and planned income per enterprise. Now decide in which months (often seasonal!) to allocate income.

List the planned income for enterprises in F1 and F5.

Note:

Plan for your profit by cutting your estimated income in half. One half is allotted for profit and the other for expenses.

If you have **fixed cost** in excess of the one-half mark/ or near to it, increase the 50% on costs to 75%- 80%.

It is important to plan your profit. One of your objectives would be to see your profit return a reasonable amount on your investment.

Step 2: Develop an account for family salaries

If early on you cannot pay yourself as much as you budget, you still should strive for a system that pays you for your labour, plus a return on your investment.

Plan conservative, yet realistic. If you do not plan for this you will be tempted to draw money from the business income anyway. Plan this and stick to the amount budgeted!!!

Now list this as a cost item in F1 and F5.

Step 3: Develop an account for depreciation.

This is money you are setting aside to be able to replace or repair equipment and buildings when the time comes. Although in the early years, you may not be able to do so, it's a good idea to open an interest-bearing account into which to pay depreciation expense at the end of each year when you calculate depreciation. This will enable you to do replacements and repairs when required.

Start in early years by budgeting for small amounts – to get the habit going!

Now list this as a cost item on F1 and F5.

(Actual depreciation will be calculated and indicated in the My Farm F6: Income Statement at the end of the Financial Year or Mid-Year.)

Step 4: Monthly recording

All the planning is not worth much if you do not keep up your records of monthly income and expense!

Use My Farm F3: Monthly income and expense sheet to record **ALL** transactions with monetary value. It is critical for book-keeping purposes to record each and every little transaction – even the R5 nut that you have bought from the Hardware shop.

NB TIPS:

- Keep an envelope with you in your vehicle. Every time that you buy anything – put the slip into the envelope.
- Do weekly recording of income and expense base on your receipts and invoices/ cash slips. Monthly may be too much at a time.
- Once you have recorded all transactions staple your supporting documents (cash slips/ receipts and invoices) to together and file at the back of your Monthly income and expense sheet in a lever arch file.

Step 5: Record income and expense per enterprise

Transfer the transaction amounts recorded in your Monthly income and expense sheet into the My Farm F4: Monthly Income and Expense per Enterprise sheet.

This will enable you to build up an accurate database of production cost and profitability per enterprise – enabling you to make sound business decisions!

Step 6: Monitor on a quarterly basis to determine your financial progress against planned budget.

By making use of My Farm F5: Quarterly monitoring of income and expense you will be able to evaluate your progress against plan.

On a quarterly basis (1) calculate the total income and expense per line item and (2) transfer the total expense and income for the past three months into the Monitoring sheet (F5) relevant Quarter column.

Now calculate the Actual Year to date column by adding the totals per line item for the relevant completed quarters.

This will enable you to calculate the Percentage to Date of the itemized income and expenditure.

This information should enable you to plan your actions for the next quarter.

Yearend totals will provide valuable information, enabling you to:

(1) budget more accurately

(2) take relevant actions to re-align your farming operations

Step 7: Compile Income Statement and Balance Sheet

Based on your accurate and updated financial information it will, at the end of the financial year, be easy as pie to compile your Income Statement (F6) and Balance Sheet (F7).

You may also hand your financial records to an accountant to compile your Financial Statements.

THE FINANCIAL RESPONSIBILITIES OF AN AGRI-BUSINESS

There are many South African agricultural laws and Acts that govern the way in which a farmer operates on a farm. In groups of four, discuss these laws and provide your understanding of why they are in place. These laws and Acts include:

- Labour laws that refer to the following Acts;
- Taxes: PAYE and income tax.
- Types of crops produced: Restrictions on the production of certain products (cannabis/dagga) or certain animals.
- Environmental legislation: The control of activities that concern the environment.
- Health and safety: Storage and dealing with livestock.
- Export and import: Certain crops and animals are not allowed to be imported or exported.
- Labour and industrial relations: These are laws that cover the relationship between employers and employees and the state.
- Basic conditions of employment Act of 1983.
- Occupational health and safety Act, 1993.
- Wages Act.
- Workmen's compensation Act.
- Unemployment insurance Act.
- Labour relations Act of 1995.
- Employment equity Act of 1998.
- Skills development levies Act of 1998.

•

Definition:

Income tax: A tax levied by a government on the income of individuals and business firms. Taxes on personal income and business profits are major revenue sources for South Africa. These taxes are applied to repair roads and infrastructure, pays for government hospitals and clinics, government services (policy, military), training subsidies, housing etc.

Definition:

Value added tax - it is the law of the country that tax must be included in the price of goods and services, commonly referred to as VAT.

Definition:

Workmen's compensation - this is an Act that forces employers to insure their employee's disablement or death caused by accidents while they are on duty or illness caused as a result of the kind of work that they do.

Definition:

Skills levy payments - this is a levy imposed by the government on all businesses and government institutions in the country. This levy is set up to accelerate the training and development of skills in all areas of the workforce and to ensure that South Africa becomes a world-trading competitor.

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