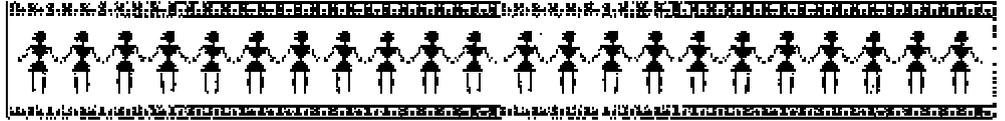


Production and Operations Management (POM)



General Objective

After studying this Unit, you should be able to help participants in your training session to identify the different activities involved in setting up and running an enterprise.

Specific Objectives

This Training Unit will help you to enable trainees to:

- List all materials, machines and human labour needed to convert inputs into finished products and/or operating services.
- Schedule all activities involved in producing goods and services.

Planning

Time : Two hours

Training methodology : Group exercise and case method

Training Materials : Charts, posters, cases – both in pictorial and written forms, case readers if participants are not able to read and write.

Trainer's Preparation: Read the Trainer's Notes on 'Organizing Production' and the case on 'Kalahandi Masala'. Preparing a list of all inputs both in words and in pictorial form. Keeping the format of the schedule ready for use. Also keeping visuals ready for all calculations.

Background Material

Introduction

In an enterprise, products/services are made or offered by utilizing raw materials, machines and tools, the services of workers, and the needed technology (production process).

The raw materials (such as leather, rubber, steel, cloth, and chemicals etc.) parts (handle, locks etc.), packaging materials (boxes, bags etc.) and the

power (electricity, fuel etc.) are the **inputs** for production of goods and operating service enterprises.

By adopting the suitable 'production process' (such as cutting, sewing, assembling, printing etc.) involving machines and tools and the services of these workers, these inputs are converted into products/services which are also called as **outputs**.

An enterprise may be involved in manufacturing of goods such as basket making, shoe or garment making etc. Others may be operating services such as repairing, white washing, transportation, band and theatres performance etc. In manufacturing, materials are used to make new products where as in operating services, materials are used but not to make new products but serve the existing product or person. Whatever the product or production process, to run an enterprise profitably, three activities are necessary:

1. **Minimize wastage** of all materials, money, time, energy and efforts.
2. **Control the quality** of product and services that meets the demand of the customers.
3. Maintain productivity so that the **cost of the product** must be well below the price that customers are going to pay.

The total efforts of managing these activities efficiently are referred to as "organizing production" or "production management". This comprises the following steps in managing an enterprise:

- Planning and Scheduling Production;
- Ensuring Flow of Materials;
- Maintaining Quality; and
- Increasing Productivity.

1. Planning and Scheduling Production

Whether it is a manufacturing or a service unit, the specified quality of products or services in desired quantity, and within a fixed time period, need to be produced by ensuring the availability of work force, machines and tools, raw materials and power. This is possible only through a detailed planning and scheduling of all activities from the stage of accepting the order to the time of delivery.

Procedure

Step 1

Trainer / facilitator presents the concept and need for planning and scheduling production.

Illustrate the case of 'Kalahandi Masala'. Distribute the 'Additional Information Sheet'. Participants may be asked to find out answers to the following questions:

A) **Product**

- What product/s to be produced? 1. 2.
- What is the quantity to be produced? How much do they want to produce?

	Per Day	Per Week	Per Month
Product 1			
Product 2			

In what form (packaging) do they want to sell these products?

	Packaging Units	Number	Quantity	Total
Product 1				
Product 2				
Product 3				
			Total	

B) **Production Activities**

- What Activities are involved in Production? (from receiving input to delivery of goods)
- How many hours are required for each activity?

Activity	Labour hour per unit Activity	Total labour hours required

C) **Workers**

- Who are they?
- How many hours will each of them work? Daily Weekly
- Who will do what?

Step 2

Once the information is gathered and shared in the open group, participants may be given the concept of drawing a schedule of activities. The exercise of preparing the schedule can be done individually or sitting in small groups. The schedule should clearly indicate which activity is to be done by whom, when, and how. For a microenterprise a simple production schedule will be as follows:

Activity	Hours of work	Who will do it	When	How/Sequence

Step 3

Help participants to estimate the capacity utilization of machinery if any. Also to verify if there is enough work for each worker and there are enough workers for each work. Some work can be brought to the schedule by making a few changes or by using spare capacity of workers of machines who are ahead of the schedule.

Processing

The whole session on production planning and scheduling should be treated as a practice session. Participants are assisted in culling out information from the given case and additional information sheet. The calculation should be made simple by using small numbers. While practicing, the participants should be allowed to develop understanding so that they can apply the same principles in the situation back home.

**Kalahandi Masala
(Spices Grinding Unit)**

Five women Malati, Sunita, Kajol, Runa and Saraswati belonging to village Bolba in Kalahandi jointly decided on running a small unit of grinding ‘Masala’– Turmeric and chilli powder.

They all are in their thirties, illiterate except Saraswati who recently picked up reading and writing, belong to Scheduled Caste and their annual family income is less than rupees twelve thousand (below poverty line).

Turmeric and chilli are locally grown in abundance. Drying and grinding of spices indigenously is a common family practice of the area.

Six months ago, these women met a social worker of the local VO who talked to them about the possibility of having income generating activity by organizing them into groups. They formed a group of 20 women and decided to raise common resources – ‘Rojgar Nidhi’ (fund for income generation activity or IGA) by contributing at least rupees twenty per month per person. They also received Grassroots Management Training which empowered them to select and plan a microenterprise. They wanted to earn Rs. 200 each as wage per week besides share in profit.

Out of the 20 women, these five women decided to form a sub-group to start a Masala Grinding unit. They were assured a loan of Rs. 2000/- from the Rojgar Nidhi at an interest rate of Re. 1 per hundred. They thought they could raise another Rs. 2000/- from their family sources. For purchase of pulverizer and grinder the local SC Corporation has agreed to give Rs. 9000/- as grant. The local rural bank officer told them that those who

have received entrepreneurship training (GMT or grassroots management training) can be given loan with 12 % interest.

As part of the GMT, these women went to the district town to conduct a market survey. They found that many shop keepers were ready to buy turmeric and chilli powder. Four of them promised to buy more than a quintal every week. They informed them that last year the price for turmeric powder varied between Rs. 25 to 30 a kg. and that for chilli powder between Rs. 40 to 45.

They were further informed that they will get 50 paise extra per packet if the supply was made in a polythene bag of 250 g and 500 g and 1 kg.

Shopkeepers told them that people within and outside the state prefer Haldi (turmeric) powder from Kalahandi since it has special flavour and bright colour. For this reason these women decided to name their Unit and the product as "Kalahandi Masala".

One of them, Sunita had a covered varandah of 20 ft size, which she offered free of cost as a common place to work. They recollected that the minimum and maximum prices for raw turmeric and raw chilli last year varied between Rs.12.50 to Rs.15 and Rs. 25 to 30 respectively. Because of the time and money limitation they decided to produce 10 to 12 kg. each of turmeric and chilli powder every day. They decided to produce on six days and one day they would go to the market to sell their product.

Saraswati and Runa went to the city to find out the details of machinery and equipment. They selected a 2 Hp pulverizer grinder for Rs. 6000, which was capable of grinding 20 kg an hour. Besides the cost an additional Rs. 420 would be the tax and Rs. 580 will be required to install the equipment. They also selected a heater to seal the polythene bags which were available at the rate of Rs. 25 per 250 g consisting of about 100 bags. They also selected a balance with weights for Rs. 500/-.

The village Bolba has electricity and they can get a line to use their grinder. They know that there are 3 to 4 groups in the vicinity who are regularly producing Turmeric powder. But none of them are producing both turmeric and chilli powder. Similarly none of them are packaging in polythene packs of 250 g. and 500 g and 1 kg.

Before launching their enterprise, these women are now busy preparing their Business Plan which will give them a clear picture about the activity to be carried out, resources that are required, marketing strategy that is to be followed, and the profitability the Unit is going to yield.

Additional Information Sheet

(Adapted for the case on Kalahandi Masala)

1. Grinder that they bought was of 1hp with production capacity of 6 kg. an hour
2. Electricity available for a maximum period of 6 hrs. a day
3. Maximum production per day = 60 kg.
Per week = 360 kg. @ 60 kg. x 6 working days
Per month = 1440 kg. (360 x 30 days)

4. Proposed Production – 72 kg. each of turmeric and chilli powder
5. Proposed Packaging – for each masala 10 packets of 1 kg. each
24 packets of ½ kg
200 packets of ¼ kg

**Planning and Scheduling Production
(Adapted for the Kalahandi Masala)**

1. Planning

A. Production Details:

Product	Per day	Per week	Per month
1. Turmeric Powder	12 kg.	72 kg.	288 kg.
2. Chilli Powder	12 kg.	72 kg.	288 kg.
		Total	576 kg.

Packaging Product	Units (Kg.)	Number	Per week (Kg.)	Per month (Kg.)
Turmeric Powder	1	10	10	
	½	24	12	
	¼	200	50	72
Chilli Powder	1	10	10	
	½	24	12	
	¼	200	50	72
Total 468 packets				

B. Production Activity

Activity	Per Unit labour hour	Total labour hours required
1. Purchase of raw materials	10 hours (Once in a week)	(144/12) 10
2. Cleaning and drying of raw materials	Turmeric and Chilli 1 hr. for 12 kg.	(144/6) 12
3. Grinding	6 kg. per hr.	
4. Weighing and filling of plastic bags	5 min. per packet i.e. 12 packets an hour.	(468/12) 24
5. Sealing of bags and labeling	5 min. per packet i.e. 12 packets an hour.	(468/12) 39

Activity	Per Unit labour hour	Total labour hours required
6. Delivery of finished products	10 hrs. (Once a week)	39
7. Cleaning and oiling machine	2 hrs. in a week	2
8. Maintaining accounts	1 hr. per day for 4 days in a week	4
		(in 7 days) 140

C. Workers

1. Who and How Many?	Five workers, all members of the group
2. How many hours of work by each?	4 hours a day on all 7 days in a week
3. Who will do what?	Only worker 5 maintains accounts. All others share all activities.

Schedule of Activities

A schedule of activities based on the requirements mentioned can be developed specifying the activities, work hours, who will do the activities and for how long, when and how.

Organizing Production

In a microenterprise every person normally knows all the processes of production and invariably does work in all the stages that the product goes through. However, to ensure timely and quality production, there is a need to plan and schedule work according to the skill, capacity and the time that members can devote.

As a first step the demand of various products/services is estimated on the basis of market survey or actual order. Based on this, inputs needed for manufacturing a product or operating a service, capacity utilization of selected machinery, and needed hours of human labour are estimated. Such estimates form the basis of planning of supplies and scheduling production work including maintenance of machinery and equipment.

The *supply of inputs*, raw materials, tools and spares should match the requirement of each production Unit or machine. The Unit should neither remain idle due to lack of materials nor is the 'carrying cost' allowed to inflate due to irrational hoarding of inputs.

The supply of inputs are planned indicating the source, period and mode of procurement. The plan should have the flexibility to suit the changing customers' need.

The *scheduling of production work* is done considering the type of 'line flow' where the production goes in sequence changing the characters of all the items until the final product emerges. The work is scheduled to use maximum capacity of the machines. Each worker at the same time is provided work. Similarly there should be sufficient workers for all functions and all machines (simultaneously or in sequence).

Maintenance of machines is another important aspect of planning to avoid unexpected breakdowns resulting in stoppage of work. A schedule of preventive maintenance wherever machines are involved in production, is necessary. Sometimes this can be planned on the weekly off – day or during a power cut or even after production hours. The main consideration is that production may not stop when it is needed.

Production Planning and Control covers the full cycle from operation to delivery and not limited to just manufacturing. It broadly includes the scheduling i.e. instruction/ information used for implementation and the data collected to plan control at all the stages. The successful production control is attended through four major steps:

1. Planning the route, based on the standard capacity of machine and tools (85% capacity utilization is considered very good).
2. Scheduling an 'instruction procedure' to ensure that all workers know what needs to be done by whom and when.
3. Details of all materials required ensuring that these are available at the time of their use in needed quantity and quality.
4. Means of monitoring actual work – output, stocks etc. to compare equal progress with the plan so that appropriate action can be taken. Some work can be brought to the schedule by making few changes or by using spare capacity of workers or machines who are ahead of the schedule.

Ensuring Flow of Materials

For managing an enterprise – small or micro – it is necessary to ensure timely supply and availability of materials at the right time, in the right quantity, of right quality and at the right price. These materials could be basic raw materials needed for production, packaging and maintenance, spare parts or tools, goods in progress (semi-finished goods) and finished goods – both in stock and in transit. Every enterprise, therefore, must maintain an *inventory of materials*.

The inventory of a microenterprise is simple, but significant. It has many advantages:

1. If managed well, materials are readily available when required for production/use.
2. Again, if managed well, Quantity discounts can be availed of by placing large orders.
3. The finished goods inventory allows a firm to meet the requirements of the customers.
4. The demand may fluctuate over time and the finished goods inventory helps in reducing the impact of such fluctuation on the process of

production. However, the 'holding of inventory' has certain costs called 'carrying costs'.

Since the holding of inventory has both the advantages and carrying costs a balance needs to be reached in operating it. In order to decide when to order an inventory, three considerations are necessary:

- Average time that lapses between the placing of an order and receiving the goods (often called as Order Lead Time);
- Average rate at which an inventory is drawn over a period (usually termed as Usage Rate), and
- The level at which the order must be placed so that an inventory is replenished before the stock reaches zero level or 'stock out' (reorder point).

A reorder point is estimated by using the formula:

Reorder point = Usage Rate x Lead Time

For example, an enterprise uses 10 bags of straw per day (usage rate) and the supply is made on the 15th day after receiving the order (order lead time), a new order must be placed when the inventory level reaches 150 units (reorder point 150 = usage 10 x lead time 15).

The next step is to determine *how much to order*. If the order quantity is large, the order has to be placed less often and the 'order processing cost' will be less. But as the order increases the 'carrying costs', also increase. On the other hand, if the individual orders are reduced, the carrying cost will be less but the number of orders will be more and total order processing cost will increase.

A balance between the two opposing costs – order processing costs and carrying cost is the basis to determine how much inventory to order. It can be estimated by using the formula:

$$Q = \sqrt{2CS/I}$$

Where, 'Q' is desired Economic Order Quantity

'C' is the annual usage or demand of the item in the enterprise

'S' is the cost to place an order, and

'I' is the annual carrying cost per unit.

For example, if the annual usage of yarn bundles is 2000 in an enterprise, and the order processing cost is Rs. 50 an order, and the carrying cost is Rs. 500 per bundle per year, the Quantity required to be ordered will be 20 bundles (under root of 2 x annual usage 2000 bundles x order processing costs Rs. 50 divided by carrying costs Rs. 500/-).

Purchasing

In a microenterprise, on an average more than half of its sales income is spent on the purchase of materials and components. Very often production functions in a microenterprise are interrupted or stopped because:

- Women entrepreneurs had forgotten to order new goods to replace those sold or used.
- They had placed the orders too late.
- They did not order the required/right quantity.
- The goods supplied against the order was not of the quality they needed.
- They had no information about their stocks being low.
- They wanted to buy when goods were not readily available in the market.

Most of these problems are related to the purchase policy and practices. Purchasing functions are best performed by buying materials of the right quality, in the right quantity, at the right time, for the right price, and from the right source. This involves the following considerations:

- Working out the requirements of all types of materials, usage rate, reorder quantity, their specification, sources of supply, and stock at hand;
- Lead time – time difference between placing the order and actually receiving the goods;
- Mode of transport and place of procuring materials – local, distant or foreign;
- Fluctuation in terms of price and availability – due to demand, season or government policy;
- The source and cost of obtaining finance for buying goods – interest rate of borrowed finance more/less than likely price rise;
- Inspection of goods either complete (each one tested) or partial (sample tested) before placing purchase order;
- Developing good vendor relationships to ensure emergency supply, scope to modify an order, readiness to bear with delayed payments arising out of financial exigencies; and
- Provision of alternate sources of supply to minimize the chances of stock outs, and to avail benefit of cost reduction as per the prevailing market price.

Purchase practices may be made efficient by adhering to certain rules of stock control. These are necessary to make sure that the enterprise does not suffer either from run out stock or holding too much of any item causing financial loss.

1. Regular checking of stocks
2. Keeping stocks in a way to easily see and count
3. Applying first in first out (FIFO) rule to use stored items before dispatching new arrivals.
4. Keeping simple stock cards (Bin Cards) as illustrated, if the number of stocks becomes large.

Stock Card			
No.			
Name:			
Unit No.			
Reorder at : 150 bags			
Date	In	Out	In Stock
August 15			190
August 16		10	180
August 19		30	150
			Reorder
August 30	200	100	250

Maintenance of Quality

Quality is the performance of the product in accordance with the claim made by the producer to the customers. Quality also refers to the intended use for the price of a product. Quality thus is a relative term and it must be viewed accordingly.

For attaining quality, all standards with reference to raw materials, components (packaging, workmanship, and performance) must be clearly stated. The variation in quality standards of products must be kept within the specified tolerance limit through:

- Prevention of occurrence of a fault;
- Detection of it as soon as it occurs; and
- Rectifying it at the earliest.

Quality control is a process of regular checks through inspections to ensure that the product's quality matches the laid down standards of performance. Quality testing and measuring tools and equipment are one of the essentials of an enterprise. For quality testing various methods are used. These are:

- 100% inspection,
- Spot checking, and
- Inspection of samples drawn from the lot.

Quality cannot be maintained unless it is built into the product, which means quality of all inputs going into the making of the product must be checked at all stages of production. It is also easier to correct the defects, if any, at the stage of processing rather than waiting to inspect the finished product.

Time and money spent on quality control is not wastage but an investment, which pays by minimizing rejection and earning consumers' confidence and credibility.

Increasing Productivity

Productivity is the relationship between output and input. The more output from a worker or machine per day or per hour etc. means more productivity. Different productive ratios are used to measure cost and efficiency. For example, electricity consumed per unit of production, labour utilization per unit of production and rejects per unit of production. Higher productivity is always a function of higher technology and good management.

Two major approaches are made to increase productivity:

1. *Creating Culture of High Efficiency:* Can be achieved by motivating workers to be innovative, competitive and cost effective in all such activities in which they are engaged. This is done by familiarizing workers with various measures of productivity, in addition to upgrading working conditions, providing feedback, involving them in decision making and planning. Recognizing and rewarding workers for improvements also helps in increased productivity.
2. *Reducing Waste of All Types and Forms:* Cutting costs on power, materials, machine time and human labour are some of the methods to reduce wastage. Result is lower cost and higher output per person, per machine and/or per unit time and investment.
3. *Cutting Costs of Materials:* In a micro enterprise very often the cost of raw materials alone is more than 50-60 % of total cost incurred. It is, therefore, necessary to estimate which inputs account for major share of the total cost of product. The attempt should be to reduce costs of such inputs as far as possible.

A few methods to achieve this could be:

- a) Good buying – not necessarily buying cheap but buying materials which are faultless and can be utilized fully and suitably for the final product.
 - b) Minimizing waste – It has been noticed that in many enterprises like woodworking, shoe making, dress making etc., skilled and bulk cutting make great savings which ultimately lead to productivity improvement.
 - c) Omitting defective work – Provision of skill training, good tools and working conditions, close supervision and inspections lead to increased productivity.
 - d) Controlling labour costs – Checking wastage time of the labour force in non-productive work also leads to enhanced productivity.
4. *Cutting Machine Time:* Machine time goes waste either because workers spend too much time fetching material, or the next job is not kept ready or also because there is a breakdown in machinery. Maintenance of machines following a set schedule helps cutting machine time.
 5. *Good Workshop Layout:* This reduces time in transporting goods from one point to the other. Saving in terms of time and labour translates into productivity improvement.