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CABBAGES & LEAFY GREENS

- A POST HARVEST HANDLING GUIDE

- GOOD MANAGEMENT PRACTICES FOR PIG PRODUCERS
- KEEPING CABBAGE WINTER BOLTING UNDER CONTROL
- HOW SUPPLY AND DEMAND AFFECT FARMER'S PROFITABILITY
- SWEET POTATO LEAVES - SERVED AS A VEGETABLE
- INTEGRATED FISH-PIG FARMING
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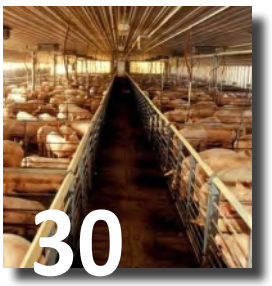

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Cabbages and Leafy Greens - A Post Harvesting Handling Guide

Careful attention to proper post-harvest handling can ensure buyer satisfaction and marketing success.

Harvesting

In Zimbabwe, fresh-market cabbage is harvested by hand though in other countries machine harvesting has been attempted.

A mature head of cabbage generally weighs from 1 kg, depending on variety. Cabbage should be harvested promptly when the heads are firm and mature. Delaying harvest even a few days beyond maturity can result in split heads and increased incidence of field disease. Unharvested cabbage may develop significant infestations of alternaria leaf spot and downy mildew, particularly during wet weather. These diseases can be spread through normal harvesting and handling. Harvesting immature heads, however, reduces yield, and the heads are too soft to resist handling damage. Immature heads also have a shorter shelf life than mature heads.

More Information

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An experienced picker should be able to determine the level of maturity quickly and consistently by feel and by the size of the head. The head is harvested by bending it to one side and cutting it with a knife. Harvesting knives should be sharpened frequently to reduce effort and lessen picker fatigue. The head should not be removed by snapping or twisting it since this practice damages the head and results in inconsistent stalk length and trim. Broken stalks are also

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more susceptible to decay.

The stalk should be cut flat and as close to the head as possible, yet long enough to retain two to four wrapper leaves. Extra leaves act as cushions during handling and may be desired in certain markets. Yellowed, damaged, or diseased wrapper leaves should be removed, however. Heads with insect damage and other defects should be discarded. It is essential that heads not harvested be left undamaged because fields may be harvested as many as three times for maximum yield. Harvested cabbage can be placed in bags, boxes, wagons, or pallet bins, depending on the harvesting method employed.

Harvesting aids can significantly reduce harvest labour costs, improve harvest efficiency and cabbage quality, and speed the harvest operation dramatically. Aids may be as simple as a modified farm trailer for transporting cabbage and boxes or as sophisticated as a self-propelled unit costing thousands of dollars. The more complex machines conveniently integrate and automate most of the harvesting and packing functions into a single unit. An effective but simple harvesting aid employs a simple belt conveyor attached to a tractor that slowly passes through the field alongside the pickers. Workers place harvested heads on the conveyer belt, which carries the heads to a bulk bin, wagon, or even a mobile packing station. The conveyer can be a homemade conversion of a grain conveyer or a factory-built model especially designed for cabbage harvesting. When equipped with a canopy and high-flotation tires, a harvesting aid can be operated during rainy weather.

Collards and Other Greens

Collards can be harvested as leaf-collards,

in which case only leaves of the proper size and maturity are harvested, or as head-collards, in which case the entire plant is taken. Leaf-collards can be packed loose or gathered into bunches of 8 to 12 leaves and secured with a rubber band. Head-collards are seldom bunched. Head-collards are usually harvested when plants have 16 to 20 mature leaves. Leaves that show cold injury, yellowing, mechanical injury, or insect damage should be discarded. It is essential that all leaves be of high quality and uniform in colour.

Turnip greens, mustard greens, and kale may also be harvested as single leaves or as whole plants. Fields are usually harvested several times, but care must be exercised to prevent damage to the plants. At the packing shed, the greens are removed from the bulk containers onto a grading belt for cleaning, sorting, and packing.

Post-harvest Handling

Harvested produce should always be removed from direct sunlight and transported to the packing shed as soon as possible. Cabbage and leafy greens are particularly susceptible to wilting and other damage from high temperatures. When there is a delay of more than an hour or two between harvest and packing, a water drench or spray arrangement can help prevent dehydration and overheating.

Cabbage

Proper packing and cooling are essential to maintaining the freshness of cabbage. Freshness can be tested by rubbing two heads together; if they are fresh, they will make a squeaking sound. Cabbage should be cooled immediately after packing. A refrigerated room controlled to 0°C and 95 percent relative humidity is ideal. In this environment, the centre of a medium-sized cabbage should take about 18 hours to cool from 26 to 0°C. It is usually not necessary to cool cabbage by more rapid means, although some packers use forced-air cooling fans to greatly decrease cooling time.

Greens

Greens that have been harvested during rainy weather are often contaminated with soil. They are normally washed in fresh water or in water chlorinated at 75 ppm before they are graded and packed. Mustard greens, turnip greens, and kale are banded into bunches. Leaf-collards can

be treated similarly. Head-collards are usually packed with 8 to 16 bunches per container. Leaves that have yellowed, show signs of disease, or have other obvious defects should be discarded.

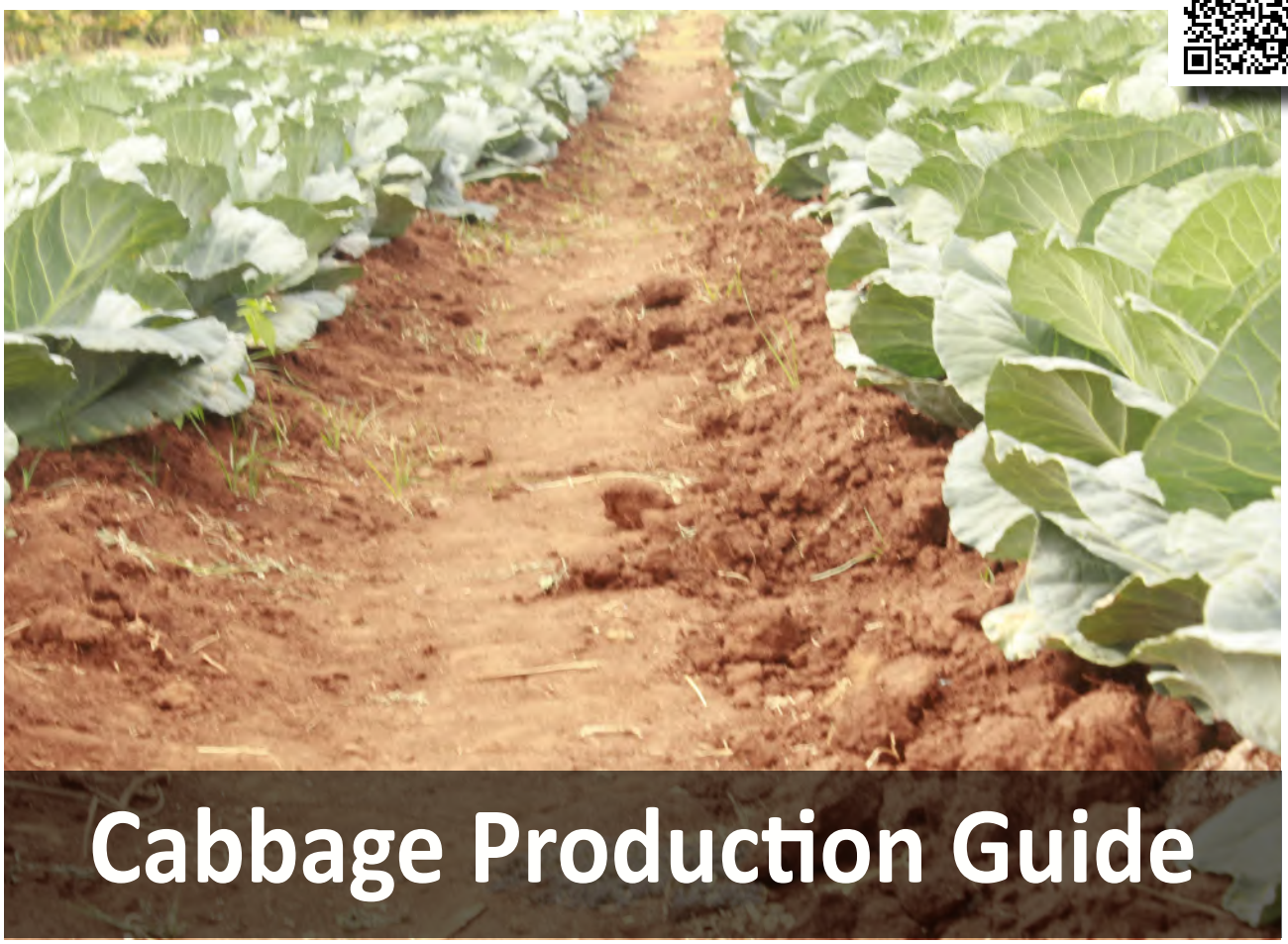
Rapid cooling either by hydrocooling alone or in combination with package icing is essential to maintaining the quality of leafy greens. Greens may be held in refrigerated storage under ideal conditions for as long as two weeks. Cabbage and all types of leafy greens freeze at about -1°C and are sensitive to ethylene gas. These items should not be stored or shipped in proximity to fruits and vegetables that are known to produce ethylene, such as apples, pears, peaches, or tomatoes.

Marketing

To market a crop successfully, producers must always be aware of the supply and demand, which vary with season and locality.

To gain and retain a market for their crops, cabbage and greens producers need to reduce cost per unit and offer buyers improved quality by using proper post-harvest practices, such as cooling and strict quality control. A prudent grower always makes marketing and post-harvest handling arrangements before planting.

Adapted from NC State Extension



Cabbage Production Guide

Site Selection

Soils can be medium to heavy with good water holding capacity. Sandy soils tend to require more frequent irrigation cycles and require higher levels of fertilization. PH levels should be between 5.5 and 6, so soil samples need to be taken prior to planting. Cabbages respond very well to compost enriched soils. Levels of 20 to 30 tons per hectare of well-prepared compost will benefit and reduce levels of fertilizer.

Manure and chicken litter can also be used but must be well broken down and composted or root burn will occur. Manure 10 to 20 tons per hectare and chicken litter 2 to 5 tons per hectare.

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Ploughing should be done to a depth of 30 – 35cm making sure the old plough pan is broken up. Ripping then discing is also a way to prepare a tilth for planting. Final tilth must not be too cloddy or too fine.

It is recommended that you dip your seedlings in a solution of Actara to give the plants 6 weeks protection from aphids and white fly. Also apply a foliar spray of Bion to the seedlings to activate the plants' own defense mechanism against bacterial and virus attack.

Spacing

Planting can be done on beds during the rainy season which helps with drainage and on the flat during the winter period. If beds are made, they should be 1.5m center to center with 2 rows on the top of the bed between 50 to

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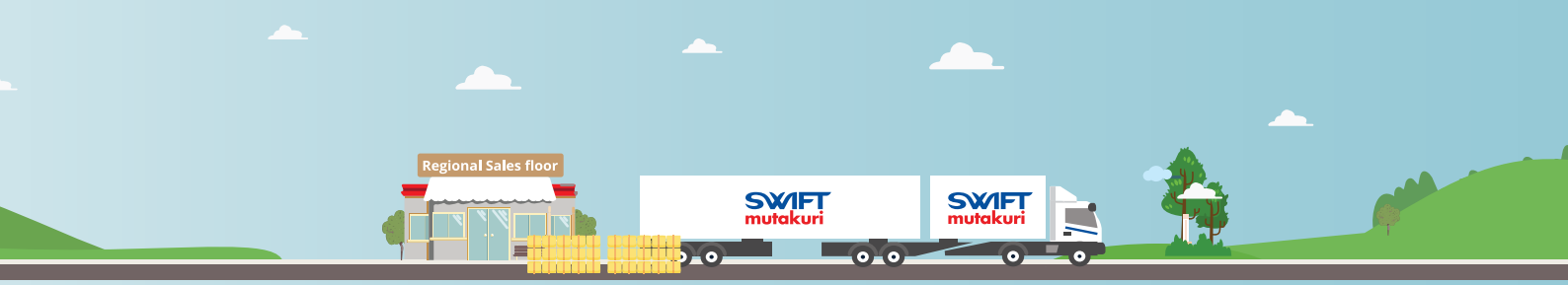

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60cm apart and planting stations 30 to 35cm in row.

Planting on the flat rows can be 50 to 60cm apart and planting stations 35 to 40cm in row. Plant populations should be between 33,000 – 40,000 depending on market requirements. Higher plant populations tend to give smaller head sizes.

Fertilizers

A balanced basal Compound type fertilizer of either "A", "B" or "C" should be applied prior to planting. This can be done using a Vicon spreader if growing on the flat or a ridger type applicator if planted on beds.

Cupping with fertilizer cups by hand into the planting hole can also be done but the fertilizer must be well mixed in the hole to prevent root burn. Based on soil analysis results and soil types, rates of fertilizer can be applied ranging from 600kg – 1,000kg per hectare.

Cabbages will require around 400kg a hectare of AN split into 3 applications between weeks 2 and 8 after transplanting. During the rainy season if the crop is planted on lighter soils an extra top dressing might be needed after heavy leaching rains.

Seedlings

Planting with seedlings is the most practical method as seedlings which are strong and healthy at transplanting is the base for a uniform crop helping with reduced costs at harvest. Plant around 10% more plugs per hectare of your selected plant population, this should ensure good seedling selection.

When using seedlings or speedlings as they are also known, at transplanting make sure good plug to soil contact is made so the root system can leave the plug and quickly enter the fertilizer enriched soil. Plant the speedlings as soon as possible after pulling them from the trays to avoid the tiny hair roots drying out. Plant into pre irrigated soils in which the soil has been made up to field capacity.

After transplanting, a light settling-in irrigation is required to remove air pockets between the plug and the soil.
It is recommended that you dip your seedlings

in a solution of Actara to give the plants 6 weeks protection from aphids and white fly.

Also apply a foliar spray of Bion to the seedlings to activate the plants own defense mechanism against bacterial and virus attack.

Varieties

Selections of a variety depends on where it is to be marketed. Cabbage varieties vary in size from 2.2kg up to 7kg per head. Varieties must be selected if to be grown in summer or winter. Summer varieties must be "Black Rot Tolerant"; this disease comes in during hot humid weather and can decimate a crop if not resistant to "Black Rot".

Varieties need to have a waxy layer to deter "Diamond Back Moth" from damaging the crop. Seed Co supplies a good range of varieties that can be planted in summer during the rains, with amazing black rot and Fusarium yellow tolerance like the hybrids Fabiola F1, Delight and Marcanta.

A good "self-wrapping" type of cabbage is necessary to retain quality and freshness. Color of the head is important for the market and the shape. Contact a Seed Co Agronomist for advice of which variety to plant and at which time of the year and for market advice.

Harvesting

Cabbages are ready for harvest when the head is firm to the touch when pressed and the veins on the outside leaves just begin to crack. Ideally about 60% - 70% of the heads should be cut at first harvest, ensuring maximum yield potential.

Depending on variety selection and time of year, cabbages mature from about 65 – 130 days after transplanting.

Irrigation

During the dry winter months irrigation is essential. Overhead sprinkler irrigation is the most common, followed by flood and more recently "drip" irrigation.

During summer production, being able to apply irrigation during long dry spells will ensure a good even viable crop. Approximately 600mm – 750mm of irrigation should be allowed to produce a good crop. So, planning water usage from, dams, rivers, and boreholes can be worked out to match hectares to be planted. As the plant increases in size and leaf area, the amount of water required also increases. Irrigation should be planned on a weekly basis and the soil depletion area checked regularly to plan for the next irrigation cycle.

The use of an "Evaporation Pan" should help with this. On medium to heavy clay soils irrigation should be given when approximately 25% of available water has been used.

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- Mechanical test to check soil structure
- Plant tissue analysis for N, P, K, Ca, Cu, Zn etc
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Keeping Cabbage Winter Bolting Under Control

Bolting in vegetable crops refers to the plant flowering and producing seed prematurely. In a cabbage crop this would result in the produce being unmarketable and therefore reduced income. Bolting in cabbage is generally triggered by cold weather and can be initiated fairly early in the plant's development, with the bolting itself occurring when the plant is more mature.

Factors Inducing Bolting:

The seedling has to have a leaf width of about 10 cm for bolting induction to occur. Bolting can then be induced by temperatures ranging from 5 °C to 15 °C, but particularly below 7 °C, provided seedlings are exposed to such cold for a lengthy period of time.

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The length of cold required to induce bolting is dependent on a number of factors which are;

Fertility of Seed Beds:

Seed beds and seedling trays that are over fertilized will cause the plant to have premature seed shoot development. This in turn causes the plant to rapidly grow and become large enough for bolting induction to occur.

Secondly, excess fertilizer, especially Nitrogen, favours leaf development over root development which causes greater transplant shock.

Size of Seedlings at Transplant:

Oversized, vigorous seedlings would be more inclined to bolt than smaller seedlings, for the same reasons as above.

Size of Plant at Induction Temperature:

There is a minimum plant size required for bolting induction to occur. Generally this size would be when the leaf width of the seedling is about 10 cm. This size would vary from variety to variety and would also be determined by the width of the growing point of the plant.
A variety with narrow

....continued on page 16

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leaves and thick stem could be induced at a narrower leaf width.

Growth Checks:

Once the induction has taken place, the response time to bolting is influenced by a number of factors. If there is a growth check, then the response time is shortened and the plant can begin bolting quickly. These growth checks can be caused by heat waves, drought, water logging, disease after induction size has been reached, fertilizer and phyto-toxic sprays.

Diurnal Swings:

Large diurnal swings are included to cause the plants to bolt very fast once induction has occurred. Induction would depend on the lower temperature of the diurnal swing.

Cold Fronts and Heat Waves:

Cold fronts produce low temperatures that may induce bolting with heat waves shortening the response period. If there is succession of such weather bolting will rapidly occur.

Maturity of the Variety
Varieties that are later maturing can be more susceptible to bolting than those that are early maturing. The reason for this may be that the growing point of the plant, which is sensitive to cold, is quickly covered in early varieties. These plants will also head before the response time has taken effect.

Later maturing varieties are subjected to cold conditions for longer periods of time which may cause increased stress and bolting induction.

Heat Susceptibility of the Plants:

Heat resistant plants are more prone to bolting than heat susceptible varieties. To breed for heat resistance, one automatically predisposes the variety to get early induction to bolting.
To select a safe variety for the whole year is difficult therefore heat resistant and cold resistant varieties should be kept for their specific slot. Heat resistant varieties are also more inclined to be later maturing varieties.

Cold Grown Seedlings:

It has been stated before that the plant is responsive to induction to bolt when the leaf blade becomes 10 cm in width.

However, seedlings which are sown in very cold areas are more prone to bolting that those that come from warm areas and transplanted into the same field.

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Sweet potato leaves - served as a vegetable

The Sweet potato leaves, which grow abundantly in poor soil, wet soil and rich soil, can be continuously cropped until the root vegetables are harvested. Some varieties of plants have naturally occurring phytochemicals that offer protection against certain dangerous diseases. Sweet potato genotypes with tops with high polyphenolic content and are used as a vegetable, food ingredient and as a nutritional supplement promote good health. Sweet potato leaves contain high concentrations of polyphenolics when compared with the major commercial vegetables such as spinach, broccoli, cabbage and lettuce. Thus, sweet potatoes offer the possibility of adding greatly to the available food supply and to the available supply of bioactive compounds for human health. Sweet potato leaves are a physiologically functional food that offers protection from diseases linked to oxidation such as cancer, allergies, ageing, HIV and cardiovascular problems. Sweet potato leaves used as a vegetable, a tea, in noodles, in breads, in confectioneries and as a nutritional supplement can be a beneficial food source.

More Information

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Sweet potato cultivars can be developed for multiple uses, especially for special nutritional purposes of protecting human health against the diseases mentioned above. Thus, the vegetable sweet potato has the potential to become a new alternative crop. But to the processing segment, they offer more promise.

The high level of phyto ¬ nutrients in sweet potato leaves provides promise of a new food additive product for use as a functional food enhancer. Sweet potato tops, able to survive adverse conditions, could serve as an additional leafy green vegetable. Acceptable sweet potato tops should be tender, glabrous and purplish. Those eating sweet potato tops prefer the top 10 cm of tips including both stem and leaves. These are the parts generally eaten in many countries.

This preference for 10 cm tops is logical, since a large proportion of the leaves in the top 10 cm are new and tender. Tips with the largest number of leaves with petioles less than 1 cm long are considered desirable because they are tender and good for the table. Researchers and extension workers could help make this vegetable's tops more appealing and acceptable. Therefore, with its tuberous roots, stems and leaves that can be consumed totally, sweet potato is a crop that may solve food, energy, resource and environmental problems in the 21st century."

Ingredients:

- USE Top fresh tips of the sweet potato leaves.
- 300g) sweet potato leaf)
- 13g curry powder/ paste
- 50ml hot water
- 1 tbsp cooking oil divided
- 1 finger-length red chilli sliced to thin sections
- 4 cloves garlic finely chopped
- 5 shallots (or 1/4 small red onion) sliced thinly
- 1 tomato thinly cut
- 1/4 tsp Maggie seasoning sauce (or fish sauce) optional
- Tiny pinch of salt to taste
- 3 tbsp water add more as needed
- 1 tbsp Red wine

Directions:

- Using kitchen scissors, snip & separate the sweet potato leaves from the stems.
- Snip the stems to uniform 2-3 cm length.
- Optional: Pull & discard the "strings" of the stems to improve the texture.
- Wash and dry the veggies.
- Soak dried shrimps in a small dish with hot water until softened, about 20 minutes. Reserve and set aside the dried shrimps
- Prepare grinded spices. Add garlic and shallots to an electric food grinder or blender.
- Add 1 tbsp oil and pulse for a few seconds.
- Alternatively, pound the ingredients in a mortar & pestle or finely chop them.
- Stir-fry the dish. Heat remaining oil in a wok-pan. Stir-fry grinded paste, garlic and shallots for a few seconds until fragrant.
- Add sweet potato leaf stems and stir fry briskly on high heat until they start to soften.
- Add the leaves and tomatoes.
- Stir fry until the leaves are reduced in volume. Then add curry paste, chillies, Maggie seasoning sauce (or fish sauce), salt and water.
- Drizzle Red wine along the sides of the wok walls during the last 10 seconds of cooking.
- Stir to coat well before serving.

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Cabbage Production Guide 1 Ha

Planting dates	• All year round
Days to Harvest	• 65 to 160 days *Depending on cultivar*
Harvesting duration	• - Days
HARVESTING	• 22 000 - 70 000 heads (Varies with spacing and cultivar)
Soil requirements	• pH 6.5 to 7.0 • Well drained fertile soils • Soil testing is key
Seed bed	• 300– 400 g in a nursery seed bed • 7 - 14 days emergence • Floating seed trays can also be used • Ensure free drainage to avoid damping off
Transplanting	• 4 - 8 weeks after emergence • Harden seedlings when they are 10 - 15cm tall
Spacing	• ***In-row***: 300 - 600mm • ***Inter-row***: 450 - 750mm
Fertilizer requirements	• ***Basal Dressing***: Compound S, 1 000kgs/ ha or manure 25 to 50 tons/ha • ***Top Dressing***: Ammonium Nitrate 100kg/ha split into 3 applications
Weed management	• ***Grasses and some broadleaf weeds***/ Lasso/Alachlor 480 EC, Ronstar 25 EC • ***Grasses only and Shamva grass***/ Agil 100 EC/ Propaquizafop. • ***All green matter and weeds***/ Agriquat/ Gramoxone/ Paraquat 20 SL.
Pests	• ***Cut worm/*** Carbaryl, Dursban, Pyrinex, Karate • ***Aphids/*** Dimethoate, Metasystox 25/ EC, Malathion 50% • ***Diamond back moth***/ Malathion 25 WP, Dedevap 100 EC, Cartap hydrochloride/Suntap, Match 50 EC/ Lufenuron • ***Hoppers/ Loopers and Crickets***/ Carbaryl 85 WP, Dipterex 95 SP, Thionex 50 WP
Diseases	• ***Downy mildew***/ Copper Oxychloride 85 WP, and Dithane M45. • ***Damping Off***/ Thiram 80 WP Sow seed thinly and drench with Thiram at 10 g/5 litres of water each week. • ***Yellows***/ Growing resistant varieties and by practicing crop rotation

Notes

- For any crop, always research and secure a market before investing in production. This ensures a sustainable farm business operation that is market driven. Answers to the following questions are important: Who will buy? At what price? Where? Who will provide transport? Are there any hidden costs of selling? Can I add value to my produce? How can I best package and sell my produce?
- Get trained on production and business. The training should cover; land preparation, varieties, fertilizer requirements, management (record keeping, accounting, marketing), pests and diseases, possible problems and solutions, harvesting, storage and transportation.
- Soil quality and water available are key to successful production. Take soils for analysis and ensure you have a reliable water source.
- Visit successful and unsuccessful farms.
- Subscribe to local farmers' magazines and research more on cabbage production business management.
- For large operations, hire an Agribusiness Consultant and an Agronomist to assist you.

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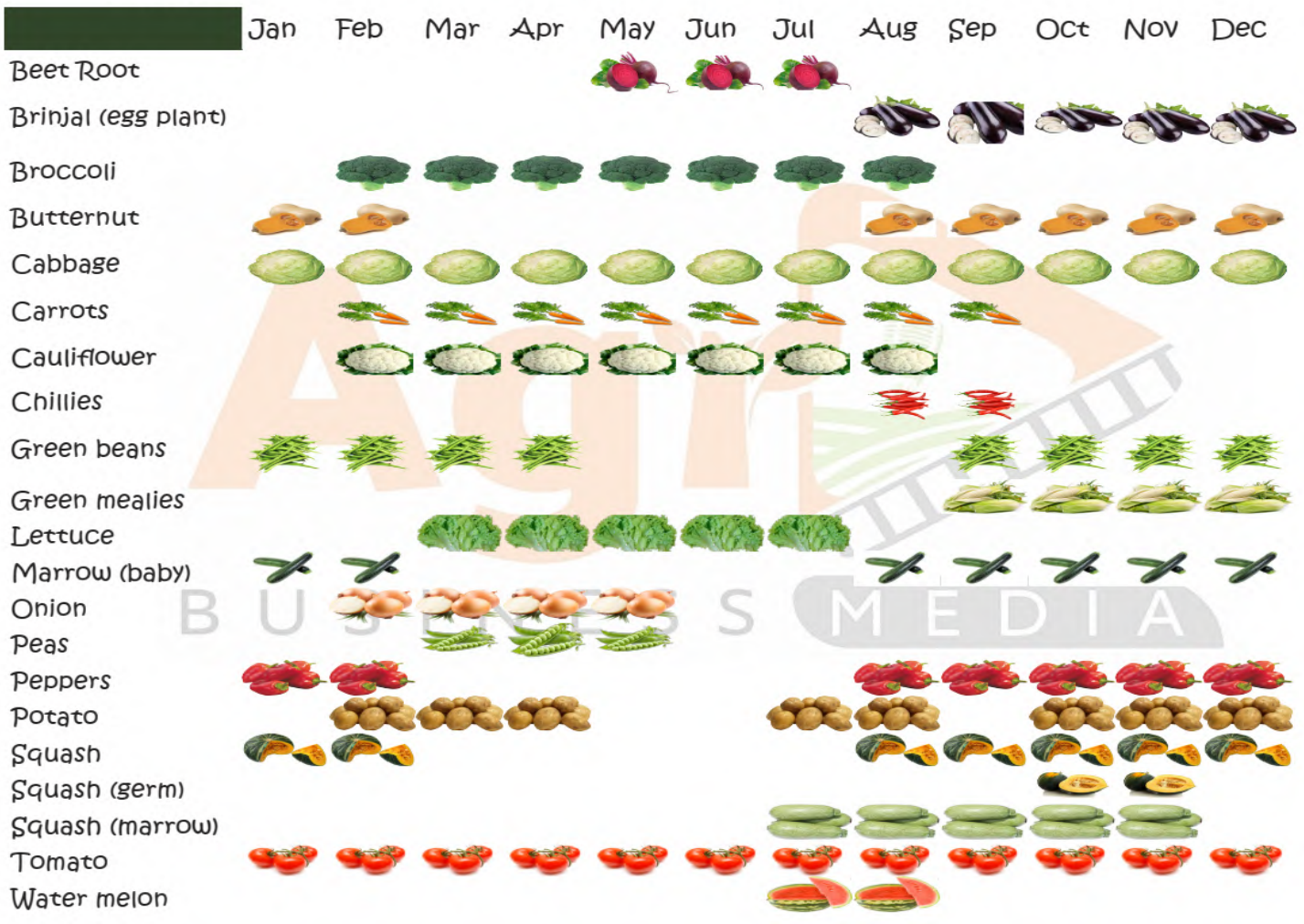

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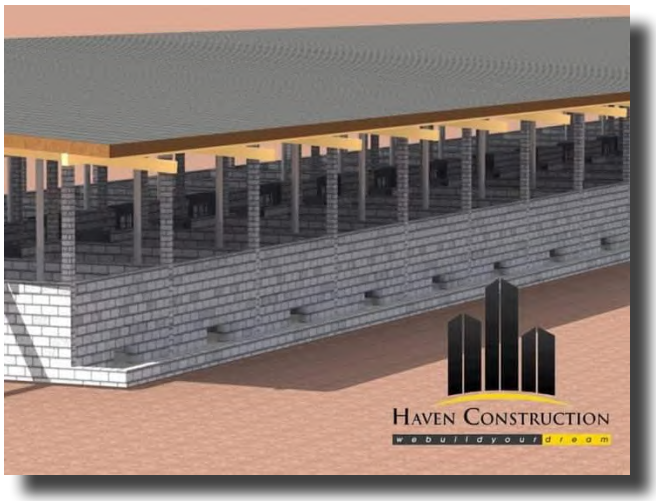

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How Supply and Demand Affect Farmer's Profitability

In a highly competitive market, every farmer is chasing his own opportunity for success. Not only are farmers striving to produce high yield and deliver quality crops to the market but also, sell their goods and finally, achieve higher profit. Farmers are therefore faced with a challenge to survive on the market.

The Relation Between Supply and Demand

Supply is a term that describes the number of goods or services that all producers are ready to offer on the market at a given period and price. On the other hand, demand refers to the number of goods or services that customers are ready to buy at a given period and for a certain price.

Regarding the relation between supply and demand, a farmer should know two important things:

1. The relation between supply and demand will determine the market price of goods or services

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What does this mean for a farmer? For example, in a case where a farmer sets a low price, the demand for his product or service will increase. Oppose to that, if a farmer sets a price which is too high, the demand will decrease.

2. The market price will determine the supply and demand of products or services

If the market price is high, the interest of producers for a certain product or service will increase. In other words, the supply will increase. Also, if the market price is low, the interest of consumers increases, which means that demand increases.

Let's Find a Balance Between Supply and Demand

Supply and demand, as well as market prices, will rise and fall until they achieve a balance, which is called market equilibrium. For example, if orange prices are too high, most consumers will choose another fruit at a more affordable price. As a response to declining sales, farmers will have to lower the prices until the demand for oranges increases again. When the demand for oranges is balanced with the supply, the market is at its equilibrium.

In a market that is not controlled, supply and demand dictate the market price of goods or services, as well as the flow of sales. By doing so, this basic economic law directly affects farmer's profitability, and therefore the success of his business.

If we look at the big picture, supply and demand regulate the entire market competition. For this reason, every farmer driven by a profit should keep up with the current situation on the market and turn the information provided by a supply and demand into profit.

-NDSU

Addressing unfair trade is a key step in transforming African food systems

by Charles Dhewa

Unfair trading practices have continued to characterize African agriculture and food systems for decades.

Determining and setting prices for agricultural commodities remains a big challenge in most African countries including local markets where the majority of farmers, traders and consumers depend for their food and income. There have not been convincing answers to questions like: Who determines pricing, packaging, measurement and supply of commodities in food markets?

How fair is setting uniform commodity prices for the country?

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Borrowing best practices from developed countries where the context is different, African policy makers have for decades been obsessed with setting uniform prices for major food commodities at national level. However, there is need for a decent conversation in different communities to figure out the extent to which prices of particular food commodities can be uniform throughout the country. While the law of averages might make sense as part of making food prices uniform across the country, that can also induce unfair trade.

From a recent survey conducted by eMKambo in Uganda and Zimbabwe mass food markets, most farmers and traders indicated that setting a uniform price for agricultural commodities for the whole country is a recipe for unfair trading because production practices are not standard in different production zones. Some soils are too fertile while others need supplementation with basal fertilizers. In the same country, the way sorghum or any crop is produced differs by district due to inputs used by local farmers.

Where farmers use animal manure and others use anthill fertile soils, costs associated with digging and applying these inputs

onto the land are often not taken into account.

There are strong views that due to different climatic conditions, supplies have to be carefully coordinated towards enhancing fair trade. If that is not done, a pocket of potatoes that cost USD7 in one community can be sold for double that price in another community which is far from the potato production zone. Paying attention to differences in agroecological regions can assist in preventing speculative pricing. This is where efficient distribution systems can address unfair trading practices by ensuring commodities are available in areas of deficit at fair prices.

Drivers of unfair trade in African economies

Principles of fair pricing are often lacking because the majority of farmers and consumers cannot tell the difference between a fair price and an unfair one due to information asymmetry, among other push factors. For instance, a trader who travels from the city to buy groundnuts or sorghum in rural areas can easily set prices for farmers using prices in urban markets

where pricing mechanisms are also very questionable. If the cost of getting reliable market information becomes too high for the majority of farmers, it contributes to unfair trading practices as those with information on prevailing market prices end up setting rules of the game for everyone. Many farmers have never seen the market in action to be able to acquire state-of-the-art knowledge on market behaviour including price-setting mechanisms. In the majority of African mass food markets, price-setting can take 30 minutes to one hour early in the morning when the market opens.

Addressing information asymmetry empowers farmers to negotiate prices with diverse buyers and determine the value of their commodities. The presence of diverse actors in one market also tends to exacerbate unfair trading practices. For instance, every African food market has micro actors like smallholder farmers, medium scale farmers and traders as well as big farmers and traders who can set prices for all small actors including consumers. Big actors with access to finance can influence market operations as well as those who bring huge volumes of commodities at once to muscle out smallholder farmers with fewer

volumes.

Using aggregation and finance models to reduce unfair trade

Making the market financially liquid provides competitive advantage to several market actors in ways that ensure fair trade. When small market actors lack liquidity, big buyers can go to rural areas and buy huge volumes of commodities for a song and out-compete small local traders, imposing unfair trading practices in the process. Enabling smallholder farmers to access finance for meeting pressing needs will ensure the farmers do not sell their commodities in a hurry at give-away-prices. This will reduce unfair trade. Another potential solution is aggregation which will enable farmers in particular communities to pool their small volumes of commodities into meaningful volumes so that each farmer avoids the cost of taking small quantities to distant markets. By minimizing individual marketing among smallholder farmers, aggregation reduces unfair trading which is often self-inflicting for farmers.

Building appropriate financial models for smallholder farmers can also reduce unfair trade by neutralizing the power held by big actors who can easily use their financial muscle to manipulate markets in ways that lead to salient unfair trading practices. One of the major push factors is that farmers lack pricing mechanisms. For instance, they are not sure how much a bucket of maize should cost for a farmer to break-even. This is largely because very few farmers do their costings in terms of inputs and all production-related costs including the cost of marketing. Such knowledge is often missing among extension officers because tracking price trends is not part of their duties. To be able to advice farmers on whether a particular price is bad, fair, good, better or best, extension officers should be able to track prices from diverse markets over a long period.

Is it the role of farmers to take agricultural commodities to the market? One of the emerging views is that it is not the role of farmers to market

commodities. Somebody should do it in a trustful manner. Farmers cannot be expected to understand a market environment which they have not known for three to six months. Due to unfair trading practices, many African farmers are opting to keep their small grains and pulses for more than two seasons rather than being at the mercy of middlemen. On the other hand, some processors also complain of being short-changed by farmers. For instance, some processors and buyers have struggled to deal with cases where farmers bring a good sample for negotiating a deal but the bulky of the consignment may comprise low quality produce different from the sample. Where some buyers have tried to buy at farmgate price, that has been impossible because such an expectation does not often take into account costs of packaging, cleaning, warehousing and fumigation at the farm. Rarely can all these services be done on-farm.

Another critical negotiation weapon for farmers is packaging. Instead of allowing traders or middlemen to pack commodities when they come on-farm, farmers should count and grade carefully before monitoring the entire packaging process. This is where unfair trading against farmers can begin. When armed with information, where a trader insists on buying and packing cucumbers at USD1 for four tubers, the farmer can demand USD1 for five tubers. In some cases, traders can bring packaging like a sack originally intended for wheat bran weighing 30kg and re-purpose for buying butternuts, cucumber, carrots, green beans, peas and sweet potatoes at 60kg on-farm. All these have different weights.

It takes alertness and experience for farmers to be aware of these complex dynamics which can easily translate to unfair trade. Farmers may also not know how hiring transport as an individual farmer is too expensive. One of the key challenges is that market-related costs are fixed and do not change irrespective of the prevailing price of commodities. Harvesting labour is often over-looked yet, depending on commodity, it can be 50c per sack. Out of 30 bags of cucumber, butternut or any commodity, a farmer can easily lose seven bags to market-related costs.

Opportunities and challenges for the AFCTA

The fact that African agriculture is characterized by unfair trade is no longer debatable. This presents challenges for the African Continental Free Trade Area (AFCTA). Trade cannot be considered free when it is not fair. For instance, how is the AFCFTA going to settle for a regional maize price when African countries have diverse climatic conditions and soils that support maize production? Is it not possible that countries that produce in abundance will set or control prices? Obviously, countries or regions with natural climatic conditions favourable to the production of particular commodities may dominate or control price-setting. Perhaps AFCTA is already examining how current trading practices are already contributing to unfair trade, with a view to correcting existing anomalies.

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Integrated fish-pig farming

The raising of pigs can fruit-fully be combined with fish culture by constructing animal housing units on the pond embankment or over the pond in such a way that the wastes are directly drained into the pond. The system has obvious advantages:

- The pig waste acts as excellent pond fertilizer and raises the biological productivity of the pond and consequently increases fish production.
- Some of the fishes feed directly on the pig excrete which contains 70 percent digestible food for the fish.
- No supplementary feed is required for the fish culture, which normally accounts for 60 percent of the total input cost in conventional fish culture.
- The pond dikes provide space for erection of animal housing units.
- Pond water is used for cleaning the pigsties and for bathing the pigs.
- The system cannot be adopted in all parts of India due to religious consideration but it has special significance in certain areas as it can improve the socioeconomic status of weaker rural communities, especially the tribals who traditionally raise pigs and can take up fish-pig farming easily.

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Culture practices

The ponds measuring about 1 000 m² may be located near your house, so that you can take care of the fish and pigs and can discourage poaching. Check and repair the dikes. The pond should be deep enough so as to retain more than 1 m water depth during the dry period.

Pond preparation

Drain and dry the pond to remove all the weeds and fish fauna remaining in the pond. If it is not possible to drain the pond, all the fish can be killed by applying 15 kg of both bleaching powder and urea for a 1 000 m² pond. Alternatively, 250 kg Mahua oil cake can be

applied which kills all the fishes and also acts as organic pond fertilizer. Pigs are brought to the pond before stocking the fish, so no basal application of manure is required.

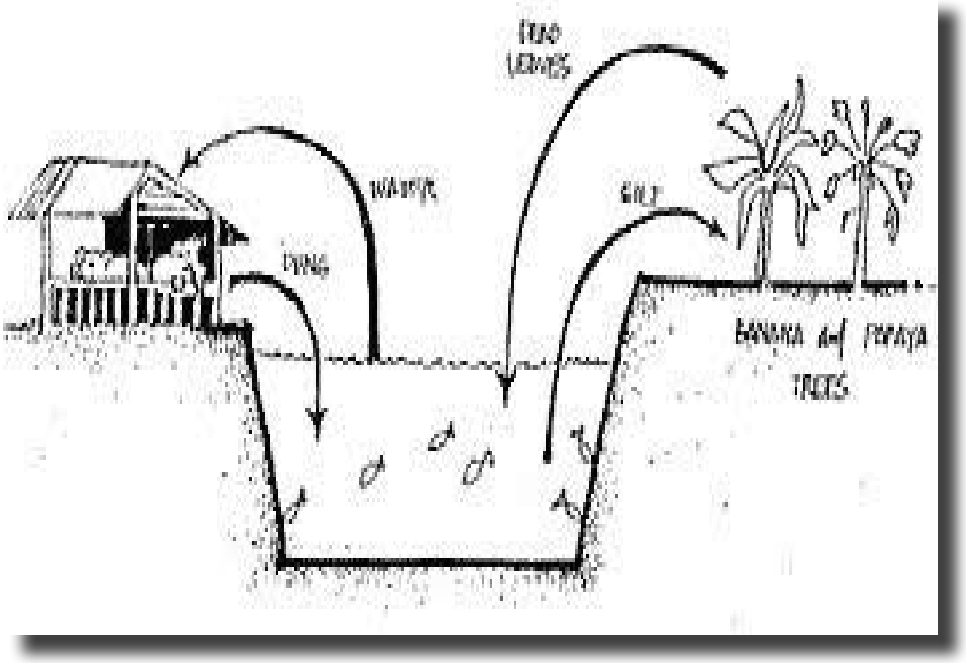
Stocking

- Stock the pond with fingerlings 7 days after poisoning with bleaching powder. The recommended rate of stocking is:
- Alterations can be made on stocking density and species ratio, depending on the local conditions.
- Grass carp should be fed regularly with aquatic or terrestrial vegetation. Liming of the pond is done at regular intervals. It helps in stabilization of organic matter. About 25 kg lime shall be required for one year.

Harvesting

Due to abundance of natural food in the fish-pig pond, the fish attains marketable size within a few months. Partial harvesting, therefore, should be done three times, depending upon the growth of fish. Final harvesting may be done after 10-12 months.

Pig raising



The number of pigs required will depend upon the pond area. The excreta of three pigs are sufficient to fertilize a pond of 1 000 m². So three pigs may be raised on a pond of 0.1 ha. As pigs attain slaughter size within 5-6 months and fish raising of Indian exotic carp is done for 10-12 months, two lots of pigs can be raised along with one lot of fish.

The pigsties are constructed on the pond embankments in such a way that the washings are drained to the pond through a delivery channel. A diversion channel is always provided to divert the excreta away from the ponds as these develop algal bloom or any other abnormality. Washings of pigsties are drained into the pond after sunrise to avoid oxygen depletion. The pigsties can be constructed from any available cheap materials but the floor must be cemented with a slope towards the pond. Each pig is provided with a floor space of 1-1.5 m².

Source : http://www.fao.org/docrep/005/y1187e/y1187e16.htm

Calendar of activities for fish-pig farming

Month	Activities
August	Pond Preparation, erection of pigsties, raising of piglets
September	Stocking fingerlings, fattening and care of pigs
October	Fattening and care of pigs and fish culture
November	Fattening and care of pigs and fish culture
December	First partial harvesting of fish
January	Harvesting first lot of pigs
February	Fattening of second lot of pigs
March	Second partial harvesting of fish
April	Fattening of pig and fish
May	Third partial harvesting of fish
June	Preparation for final harvesting of pigs and fish
July	Final harvesting of fish and second lot of pigs

Good Management Practices for Pig Producers

Breeding

- Pigs are highly prolific in nature and two farrowings in a year should be planned by adopting optimal management conditions.
- For every 10 sows one boar must be maintained for maximum fertility.
- Breed the animals when it is in peak heat period (i.e., 12 to 24 hours of heat).

Pregnancy

Give special attention to pregnant sows one week before farrowing by providing adequate space, feed, water etc. The sows as well as farrowing pens should be disinfected 3-4 days before the expected date of farrowing and the sows should be placed in the farrowing pen after bedding it properly.

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Piglets

- Take care of new born piglets by providing guard rails.
- Treat / disinfect the navel cord with tincture of iodine as soon as it is cut with a sharp knife.
- Feed on mothers' milk for first 6-8 weeks along with creep feed.
- Protect the piglets against extreme weather conditions, particularly during the first two months.
- Needle teeth should be clipped shortly after birth.
- Vaccinate the piglets as per recommended vaccination schedule.
- Supplementation of Iron to prevent piglet anemia is necessary.
- The piglets meant for sale as breeder stock must be reared properly.
- Male piglets not selected for breeding should be castrated preferably at the age of 3-4 weeks which will prevent the boar odour in the cooked meat thus it enables production of quality meat.
- Additional feed requirements of lactating sow must be ensured for proper nursing of all the piglets born.

Sow

Care and management of sows are very essential since they are retained in the herd mainly for breeding. Good management and feeding will minimize problems related to breeding. Sows should be looked after with particular care so that the piglets are delivered normally and nursed properly.

Farrowing Sow and Litter:

- Clean and disinfect the farrowing pen with a solution of 2 % of phenyl lotion and keep it vacant for a week.
- The pregnant female may be dewormed 2-3 weeks before farrowing and prior to admitting into the farrowing pen. Spray with external parasiticide (1% solution of malathion/cythion, butox. 0.05 %). Scrub the under surface, sides, inter digital space and udder to remove dirt, eggs of parasites, disease germs etc. with soap and water just before moving into the farrowing pen.
- Move the clean animal to the clean pen 10 days before farrowing.
- Provide light bedding of chopped straw 2-3 days before farrowing.
- Appearance of milk in teats when pressed indicates the approach of farrowing time.
- Attend the farrowing throughout. It may last up to 24 hours.
- Wipe the piglets clean with towel/straw. Disinfect the naval cord with tincture of iodine. Normal healthy piglets suckle teats within 10-30 minutes. Help small piglets to suckle.
- Placenta, dead piglets, soiled bedding etc. may be removed and buried in time with least delay. The placenta will be expelled generally within a short while.
- Provide 50 mg iron (Imferon 1 ml) on the second day intra-muscularly to prevent piglet anaemia. Oral administration of iron solution (1 g Ferrous sulphate in 25 ml of water) 1 ml per piglet once a week can be tried. A second injection may be given at 5 weeks of age.
- Keep the farrowing pen warm, dry and clean.
- Needle teeth may be removed carefully.
- The time taken for expulsion of litter vary from 1 hour to 5 hours. The interval between the birth of the first and that of successive piglets vary from a few minutes to 3 hours. About 30 per cent of piglets are usually born in posterior presentation. Generally placenta is shed only after all the piglings are born.

Expulsion of placenta is usually within 3 hours after expulsion of foetus. Piglets start suckling within 10-15 minutes after birth. Artificial heat may be provided by using an infrared lamp / ordinary electric bulb during cold and rainy season to avoid death due to chilling.

Breeding management

The sows come to heat once in about 21 days. Good feeding and management induces heat (estrus) makes breeding easy, and larger litter size. Along with grains, fish meal. skim milk or butter milk may be given 2-3 weeks prior to breeding to allow a body weight gain of 200-300 gm/day.

Mating

The average gestation period of sow is about 112-115 days the normal litter size is 8-10 piglets. Older sows as larger litter size with high birth weight.

Farrowing

- The pregnant sow should be shifted to farrowing pen 3-4 days before farrowing to avoid disturbances and to settle down in new Surroundings. The farrowing pen should be dry, well ventilated and lighted. Bedding material should be provided in the farrowing pen.
- Prior to farrowing time, the ration of sow should be reduced to half and should contain laxative ingredient like wheat bran. The sow should be left undisturbed at farrowing and may be helped during emergencies. Remove piglets from a nervous sow and allowed to suckle under supervision. As soon as the piglets are born, they are dried with a cloth and placed in warm enclosure pig brooder.
- Brood sows should be given well-balanced rations. Feeding should be started in small quantities of concentrate mixtures along with laxatives like wheat bran.

Care and management of sucking sows

- A sow gives about 150-200 kg of milk during 8 week suckling period. Sows milk is more concentrated than cows milk hence sow require more feed. Allow 1.5kg of feed for the sow and add 0.5 kg of feed per piglet to a maximum of 5-6 kg of total ration. Plenty of Lucerne hay and succulent fodder may be provided.
- A few days prior to weaning, the quantity of feed is gradually reduced to restrict milk flow and dry the udder.

Boar

- The boar should be maintained in a separate pen. They should neither be overfed nor underfed, since both will affect its breeding capacity. It should be fleshy, and thrifty but not too fatty. The feed requirements include both the demands for maintenance and reproduction. During off-season the boar should be given plenty of grasses and legume hay and 2kg of concentrate mixture. An additional 0.5 kg of concentrate may be given 2 weeks prior to breeding season.
- Boars should not be used for breeding earlier than 8 months of age. A young boar can be used for 15-20 sows in a season and older ones may be used for about 25-45 sows. A boar can be allowed to serve before being fed. Not more than one service per day is allowed during breeding season. Older sows may be used for breeding season. Older sows may be used for breeding with younger boars.
- Boar should have free access to water and boar pen is kept clean and dry. Dampness should be avoided. The boar should be scrubbed and washed daily and kept clean.

Trimming of boar's feet periodically will prevent lameness in boars. The bolt cutters can be used to remove tusks of boars to avoid injuries to sows and attendants.

- Newly purchased boars should be kept separately for 2-3 weeks to avoid risk of introducing any disease into the farm.

Piglets

- The piglets are removed as they are farrowed and kept warm in creep space until farrowing is complete.
- Each piglet is cleaned of all mucous to ensure that the breathing passage is clear
- The navel card should be tied 2.5 cm away from the navel, remaining portion is removed hygienically and stumps are painted with iodine.
- Piglets should be nursed after birth. They nurse 8-10 times in a day.
- Piglets are born with 4 pairs of sharp teeth (2 pairs on each jaw) which may injure udder or teats. Hence clip these teeth soon after birth.
- Piglet anemia (Thumps) : Since sows milk is deficient in iron and copper piglets suffer from serious deficiency resulting in anemia. Affected piglets become weak, dyspeptic, and have distressed breathing.

Milk Feeding

This disease is also called thumps because of their difficulty in breathing. To prevent piglets anemia udder of sow may be swabbed daily with a saturated solution of ferrous sulfate for 4-6 weeks so that piglets can get these minerals while suckling the milk. Another effective method is injection of iron - dextran compounds available commercially.

- Creep feeding: Piglets take dry feed at 2-3 weeks. Provision of additional nutrients at this time is essential to have maximum growth and development. Creep feed is also called as pig starter for vigorous growth the thriftiness, sows milk alone .is not sufficient for piglets. Creep feed contains 25-30% CP.
- Creep is a device by which piglets are allowed access to the concentrate mixture. It may be arranged of the corner of farrowing pen. Creep feed is' fed from 14-56 days. The composition is as follows.

Ingredient/Parts	
Maize	65
GNC	14
Molasses	5
Wheat bran	10
Fish meal	5
Mineral mixture	1
Antibiotics	-

- Weaning of piglets: Usually weaning is done at 7-8 weeks. The sow should be separated from the piglets for a few hours each day to prevent stress of weaning and its feed is reduced gradually.
- Orphan piglets : Can be raised either with a foster sow or the use of milk replacer

Nutrition

The nutritional requirements of swine vary with sex, age and physiological status of the animal. According to the nutritional requirements, swine can be classified into 11 distinct groups as follows.

Young pigs:
Pre starter pigs (2-5 kg)
Starter pigs (5-11 kg)
Grower pigs (11-23 kg)

Weaning to market pigs:
Growing and finishing (23-57kg)
Finishing (57-91 kg)

Adult males:
Boars

Adult females:
Gilts
Un bred sows
Pregnant sows
Sows at the time of parturition
Lactating sows

Manure disposal

The dry solid dung may be collected morning and evening and stored in the dung shed. The liquid part of urine and washings may be taken to settling tanks.

Integration

Pigs can be effectively integrated to a biogas plant for meeting the cooking /lighting demand of the farmers. It can also be integrated to agriculture and fish culture thereby increasing the overall economic efficiency of the system. The pig dung is good organic manure in dried form or as compost.

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The Agribusiness Expert Answers

Q Are there any areas to avoid during soil sampling?

A

- Avoid taking soil samples along the farm boundaries.
- Avoid areas where their is manure.
- Avoid areas with trees.
- Avoid swampy areas.

Word Search

N	T	G	O	O	D	B	E	D	D	I	N	G	C
O	R	T	R	A	N	S	F	O	R	M	I	N	G
I	A	P	F	I	I	S	M	E	T	S	Y	S	Y
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F	I	S	D	E	U	P	E	E	R	C	G	Y	S
E	O	N	O	I	T	A	R	U	T	R	A	P	O
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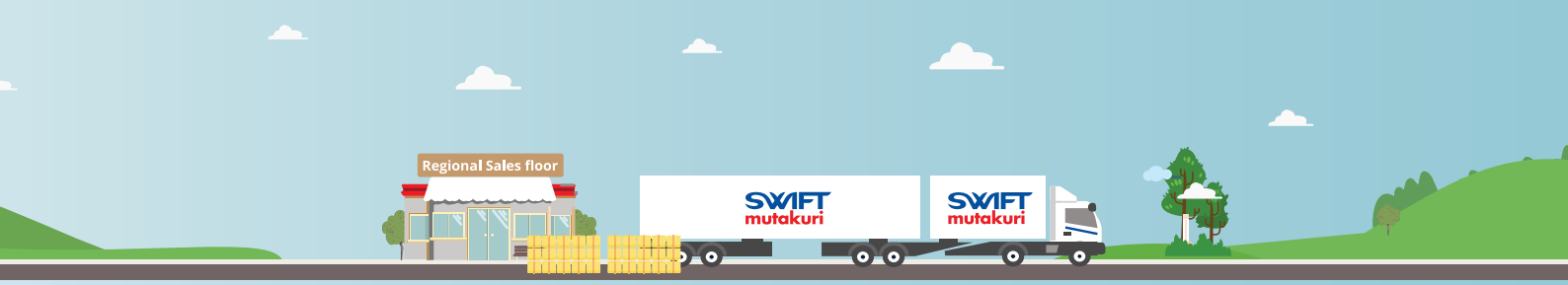

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