HYDROPONICS

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Arable Farming
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Presentation Outlines

- Introduction.
- Advantages
- Disadvantages
- The difference between hydroponic vegetable production and production in soil
- What do I need to start a hydroponic production unit
- Growth medium
- Water and nutrients
- Different hydroponic systems
- Crops that can be grown in a hydroponic system
- Greenhouses
- Conclusion

INTRODUCTION

What is hydroponics?

- Translated directly, hydroponics means plants working (growing) in water.
- The word 'hydroponics' is derived from two Greek words: '*hydro*' – meaning water, and '*ponos*' – meaning labour.
- A modern definition of hydroponics: *A system where plants are grown in growth media other than natural soil. All the nutrients are dissolved in the irrigation water and are supplied at a regular basis to plants.*
- In South Africa, hydroponic vegetable production is almost always done under protection.

Advantages

- Hydroponically produced vegetables can be of high quality and need little washing.
- Soil preparation and weeding is reduced or eliminated.
- It is possible to produce very high yields of vegetables on a small area because an environment optimal for plant growth is created. All the nutrients and water that the plants need, are available at all times.
- One does not need good soil to grow vegetables.
- Water is used efficiently.
- Pollution of soil with unused nutrients is greatly reduced

Disadvantages

- Hydroponic production is management, capital and labour intensive.
- A high level of expertise is required.
- Daily attention is necessary.
- Specially formulated, soluble nutrients must always be used.
- Pests and diseases remain a big risk.
- Finding a market can be a problem.

The difference between hydroponic vegetable production and production in soil

Field production	Field production
▪ No soil is required.	▪ Good topsoil is required. ▪ Good soil = good drainage, compost, disease-free
▪ Plants are irrigated automatically. ▪ No water stress	▪ Plants need to be irrigated to minimise water stress
▪ Nutrients are available at all times ▪ Only soluble fertilizers are used. ▪ Hydroponic fertilizer formulations contain a balanced nutrient content	▪ Nutrients must be added to soil. ▪ Unless a laboratory analysis is done, too much or too little nutrients can be added.
▪ Soil borne diseases can be eliminated	▪ Soil borne diseases can build up in the soil.
▪ Hydroponic production is not organic because artificial nutrients are always used and plants are usually not grown in soil.	▪ It is possible to produce organic vegetables in soil because one can use organic fertilizers such as compost and manure.

What do I need to start a hydroponic production unit?

Garden units	*Commercial*
• Source of clean water	• Water is the most important consideration. Quality, quantity and reliablity
• The right location	• A market. Know what, where and when to market your crop
• Specially formulated fertilizer	• Hydroponics is labour intensive. During peak season, labour must be available for 7 days a week
• Time to attend to the system daily	• Management skills: Production, labour, marketing, infra-structure
• A little knowledge of plants or gardening	• Location: Infra-structure, labour, market, etc
• A commercial or home made unit	Financing: The amount needed depends on the size, type of

Growth medium

- Growth medium is the substitute for soil in hydroponic systems.
- *The functions of growth medium are:*
- To provide the roots with O2
- Bring the water and dissolved nutrients in contact with roots
- Anchor the plants so that they do not fall over
- Many different materials can be used as long as they provide the roots with O2, water and nutrients.
- In South Africa, gravel is popular in re-circulating systems, sawdust is the most popular for the open bag system / drain to waste system.

Water and nutrients

- All the nutrients plants need are dissolved in water and they are supplied to plants every day.
- Macro elements (N; P; K; S; Ca) are needed in substantial amounts, whereas plants need very small amounts of micro elements (Fe; Zn; Mn; Mg; Cu; Co, Mg).
- It is necessary to use was specially formulated fertilizers.
- Fertilizers used for hydroponics are more pure (and expensive) than other fertilizers to prevent precipitation and blockages of the system

Different hydroponic systems

- Two different hydroponic systems are used to produce vegetables: **the gravel flow**, **or re-circulating system**, and the **open bag, or drain to waste system**.
- In the drain to waste (open bag) system, plants are grown in containers and nutrient solution is supplied to plants by means of a dripper, for up to 12 times per day.
  - The number of irrigation cycles per day depends on temperature and the growth stage of plants.
  - The crops in the drain to waste system grow tall and need to be trained and pruned so that they grow upwards as a single stem
- In the gravel flow system, the nutrient solution is re-circulated and the roots of the plants stand in a thin film of nutrient solution all the time.
  - Gravel or sand is used most often as growth medium

Crops that can be grown in a hydroponic system

- Basically all high value crops. Popular in South Africa are
- tomatoes,
- Strawberries
- cucumbers and peppers in drain to waste systems and lettuce and herbs in gravel flow systems.

Greenhouses

- Hydroponic system is practiced under controlled environment in a greenhouse.
  - Types of greenhouse
    - Shade netting (flat roof, pitch roof and tunnel type)
    - Plastic sheeting or tunnels

Conclusion

Climate change will demand more and more high value crops to be produced under hydroponic systems in future.
The system is highly technological but gives rise to high production of good quality yields per unit area.

THANK YOU

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