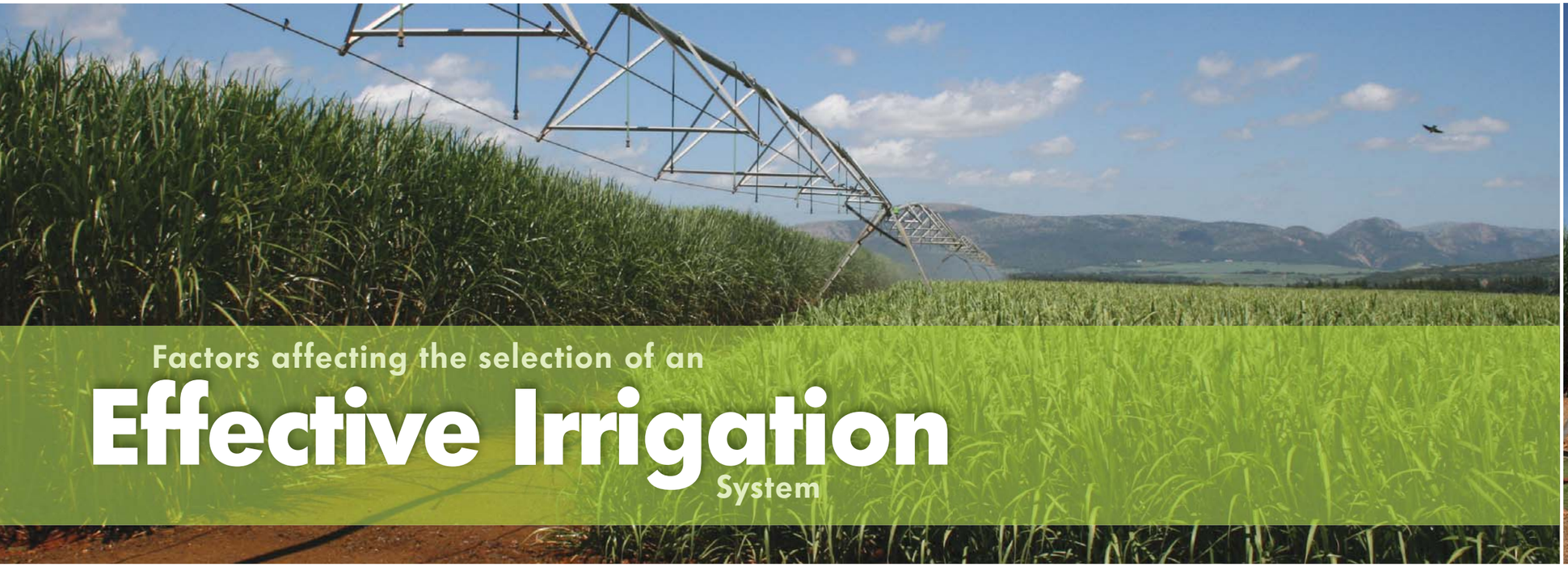

Factors affecting the selection of an

Effective Irrigation System

Better management practices (BMPs) for irrigation have been clearly summarised within the sugar industry's Sustainable Sugarcane Farm Management System - SUSFARMS®

The irrigation module of the system was compiled within a participatory forum between government, a catchment management agency, the Wildlife Environmental Society of South Africa (WESSA), irrigation specialists, SASRI Extension Specialists and sugarcane growers. The BMPs are based on recommendations made by the Water Research Commission and represent the most up-to-date, comprehensive and innovative thinking on irrigation management.

The first section of this irrigation module in SUSFARMS® relates to the selection of a suitable irrigation system which is well matched to the climate, soil, water source, crop requirements and growers' preferences.

INFLUENCE OF CLIMATE

There are four important climatic factors that determine the evaporative demand of the atmosphere – temperature, wind speed, solar radiation and relative humidity. This demand influences evapotranspiration (ET), which is the combination of water evaporated from the soil surface and the water transpired by plants. ET causes soil moisture to decrease over time. If rainfall or irrigation does not replace this water, soil moisture falls to the extent that plants reduce growth and ultimately wilt and die. In the absence of rainfall, irrigation is used to maintain soil moisture at a level where plant growth generally is not limited. Hence, selection of the irrigation system capacity is largely based on the maximum crop water requirements, ET. In other words, the irrigation system should be planned to meet the daily crop water requirement (or an acceptable portion of the crop water requirement in the case where rainfall is relatively high and irrigation is used as supplementary).

SOIL

Care must be taken to ensure that the rate of water application is not greater than the rate of soil absorption. Emitter applications which exceed infiltration rates will result in runoff or water loss in the form of deep percolation. In addition, the maximum volume of water that can be applied per irrigation event should not be greater than soil storage capacity.

An irrigation system ensures that adequate water is available in the root zone for the crop to grow at desired rates. One first needs to allow for the soil water to be depleted to a certain level before irrigation is used to refill the soil profile. Generally, depleting 50% of the soil water reservoir and replenishing the extracted volume is considered acceptable practice. This, however, is a guideline and may be altered for specific applications.

WATER SOURCE

The availability of water at the right quantity and time is paramount for optimum crop growth. Location of the water source will dictate to a large degree the capital and operating costs of systems. If the field is further away from the water source, higher investment in conveyance structures such as canals and/or pipes will be required. If the field is higher up, more energy will be required to pump the water to the field - therefore both the pump size and electricity requirements will be greater. Hence, care must be taken in the planning phase to ensure that the irrigation system is economically viable.

The second issue is water quality available from the source. Poor water quality can limit the use of micro-irrigation systems, in addition to degrading the soil and diminishing the crop yield. Silt-laden river water could also inflict excessive wear on pump impellers and nozzles in pressurised systems.

CROP REQUIREMENTS

The irrigation system must be suitable to the crop. Due to fields being harvested in portions, crops tend to vary in age and water requirements. Some fields may be fallowed or planted with a green manure crop with no or different irrigation requirements. Hence, the irrigation system controls and block layout should be aligned with the field layout for easy matching of irrigation applications to crop water requirements.

Agronomic requirements may also differ. For example, in areas where rainfall is unreliable, overhead irrigation systems are often preferred for wetting the soil surface for easy land preparation on a replant field. Similarly, irrigation systems should also be capable of fulfilling agronomic needs such as ensuring emergence of the crop after planting.

GROWER'S PREFERENCES

Finally the irrigation system must be well suited to the end user's preferences. These preferences would mostly be related to availability of labour, capital costs of the system and knowledge levels required for effective management of the system. Every effort should be made to ensure that preferences are well aligned with an effective and efficient solution that also considers the other factors mentioned above.

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