

Project proposal: Investigating the potential income and future water requirements of existing pecan orchards in the Western Cape.

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Introduction

Climate change is predicted to involve higher summer and winter temperatures and a reduction in precipitation in the Western Cape. This impacts especially on deciduous fruit farmers who are dependent on irrigation and a minimum winter chilling requirement for current fruit varieties. In addition, provincial water availability has to be allocated, not only to this major industry, but also to vegetable producers, residential areas and industry. Thus substantial changes to the current agricultural situation needs to be quantified for future administration.

In an attempt to address climate change, some fruit producers have started to investigate alternative crops such as pecan which have lower chilling requirements. Other producers started to plant pecans for diversity, to add to their annual crop income.

There is very little information available on the status of current pecan plantings in the Western Cape concerning their suitability/adaptability for production (performance) and the potential impact on the local economy and water dynamics. Quantifying these parameters may assist in management and allocation of irrigation water volumes, research funding and provincial income in future. The aim of this project is therefore to evaluate plant performance (yield) for the majority of the existing plantings identified in the Western Cape via the aerial survey to determine the suitability and sustainability of pecan as an alternative in these areas.

The pecan industry still has high growth potential with regard to worldwide demand and is also labour intensive due to the processing component. Successful expansion of plantings can thus result job opportunities in both sectors that will stimulate economic growth. The National Development Plan 2030 supports commercial agriculture with the highest potential for growth and employment and the pecan industry fits this criteria.

Although diversification of current produce towards pecan production brings a new alternative in terms of income, job creation and resilience to Western Cape agriculture – the performance of these orchards and potential impact on water resources have not been quantified. A report on

water use of full bearing pecan trees in the Cullinan region has been published and indicates a very high water demand of pecan under the conditions in that production region (Taylor et al., 2015; Ibraimo et al., 2016). Currently, another study with a similar focus is being conducted in the Vaalharts and Upington regions to further extend knowledge on how climate and management practices impact water use (NJ Taylor UP). Whilst this information may not necessarily be applicable in the Western Cape, it will still indicate water use in yet another climate region of commercial pecan production in South Africa and will assist with the parameterisation of accurate water use models for pecans. This project will also support The National Climate Change Policy is another policy.

In addition, the environmental conditions of the current pecan plantings in the Western Cape vary substantially, as indicated by the aerial survey conducted by *the* DoAWC (M Wallace Elsenburg) – resulting in different requirements for management practices in these areas. This information is lacking at present, with most of the current advice being supplied by SAPPA, which is based on different cultivating conditions e.g. the summer rainfall areas of Vaalharts, KZN and the Orange River region, with access to water from rivers in close proximity to orchards. Growing conditions are well known to influence plant performance and thus different climatic areas may justify alternative management practises. Understand water use under changing climatic conditions in this case will be crucial information in order to assess if pecan expansion is sustainable under changing climatic conditions.

Given the major impact these pecan orchards will have on the income (and human resources) and distribution of irrigation quotas in decision making of the Western Cape in the near future, this proposal addresses some of the main parameters that will provide the necessary support to assist with these very important decisions.

Materials and methods

Aerial maps (2017) captured by DoAWC (Elsenburg) indicated approximately 211 ha and 144 pecan orchards were established in the Western Cape. Contact details of the owners are being sourced to obtain additional information with regard to planting date, planting distance, irrigation type, cultivar and yield (if producers are prepared to share this) of these orchards. This will serve as a data base for the research project.

To quantify the performance and the potential impact of pecans on the local economy and water dynamics of the region, two high performance (consistent yield $> 2t.ha^{-1}$) bearing and two young, non- bearing orchards will be selected for a case study in two climatic areas. In each orchard, 10 individual trees will be selected for specific tree measurements where applicable and data will be presented as means with standard deviations (where applicable). For some parameters, each orchard's information will be discussed on a hectare basis.

More detailed measurements will be conducted to quantify the following parameters:

- 1 Quantify the climatic conditions for these orchards using existing automatic weather stations in the area with regard to temperature, rainfall, RH (if available) and chilling units.
- 2 Visually describe the phenological development of the specific cultivars on 10 randomly selected representative trees/orchard.
- 3 Quantify crop suitability as tree performance with regard to biomass accumulation (canopy development), yield efficiency (only bearing orchards) and planting distance on 10 randomly selected representative trees/orchard, as well as on a hectare basis.
- 4 Record irrigation practices and determine $ET_{(Def)}$ using Fruitlook (if possible) and compare this with existing information to estimate water requirements for these orchards on a ha basis.
- 5 Record labour requirements for each orchard (per ha) as a baseline study.
- 6 Compile a simple economic profile for each orchard (per ha) to determine the potential impact of similar orchards in these selected areas (yield, price per kg nuts and labour costs)

References

N.J. Taylor, J.G. Annandale, N.A. Ibraimo, J.M. Steyn, M.B. Gush, 2015. Are simple empirical crop coefficient approaches for determining pecan water use readily transferrable across a wide range of conditions? 10.17660/ActaHortic.2017.1150.2

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Ibraimo et al., 2016. Estimating water use of mature pecan orchards: A six stage crop growth curve approach. Agricultural Water Management 177:359-368.

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