REVEGETATION

SANDALWOOD NUTS

PREPARING AUSTRALIAN AGRICULTURE FOR RISING ENERGY COSTS AND WATER INSECURITY

Aaron Edmonds

Agricultural technology has evolved with the assumption that oil and gas will always be cheap. Large amounts of energy are used in food production, making agriculture the third largest energy-consuming sector globally. Most people would be aware of the diesel fuel requirement to power the machinery used in crop production. What they would not realise is that diesel use is only a small component of the total energy demand in this process, in fact it is in the manufacture of fertilizers used to fuel crop growth where the largest energy liability occurs. To put it into perspective, it takes the energy from roughly one litre of oil to produce one kilogram of urea, the most widely used nitrogen fertiliser. Not to mention the petrochemicals and energy required for herbicide and pesticide manufacture. Quite clearly as energy concerns begin to emerge, agriculture must reduce its dependency on energy.

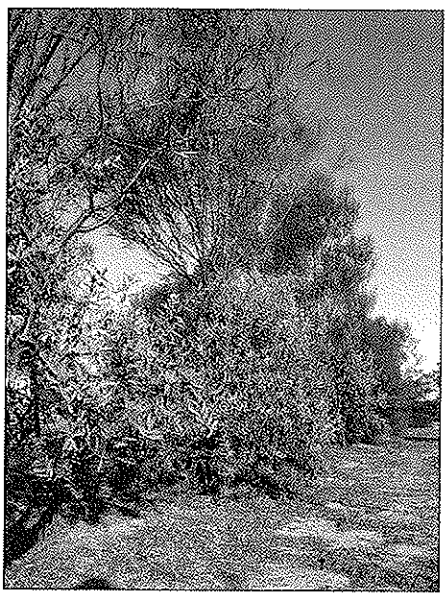
There are three areas in which total energy demand can be significantly reduced in Australian broadacre agriculture and, not surprisingly, these also bring sustainability gains almost as an added bonus. Sustainability in the true sense of the word, simply means turning agriculture from a net energy user to a significant net energy producer.

Firstly, it is highly desirable that crops be perennial in their growth habit. This means they survive from one year to the next and only need planting once. This saves on the need to annually sow common staple food crops like wheat, rice and corn. The environmental gains from a perennial plant are a large root system preventing soil erosion, enabling use of subsoil moisture to prevent salinity and allowing deep access to leached fertilizers and nutrients. Perennial plants are also far more competitive with weeds and have a level of drought proofing in having access to out of season rainfall at depth in the soil profile.

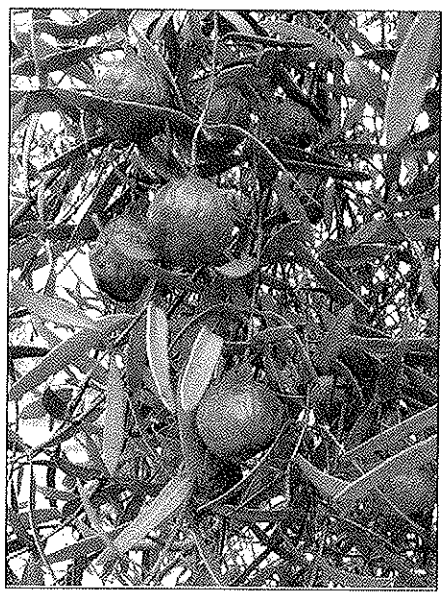
Secondly, there must be a legume base to the crop production system. Legumes (including both peas and wattles) are plants that enable nitrogen to be biologically fixed in their root systems and hence have no need for man-made nitrogen fertilizers. Some common legumes include soybeans, peas, beans, chickpeas and lentils. The energy savings in legume-based systems are enormous, simply because they do not require nitrogen fertilizer. All natural plant ecosystems have a legume base within them that is important for fertility.

Thirdly, in conventional agriculture, chemicals are required to control pests and diseases. They are produced in complex and energy-expensive industrial processes, often using petrochemical precursors. As our crops have been bred to focus almost completely on yield and not utilise traits that allow them to tolerate and compete with pests and weeds, man has ensured productivity is linked to the high use of chemical inputs. This effectively means that the energy required for pest and disease control in the plant is ultimately sourced from fossil fuels. On the other hand, wild plants and wild relatives of our commercialised crops have developed unique means to survive attack from pests and compete with other species.

Ironically it is a native plant that has not been exposed to modern man's breeding efforts that offers Australian farmers the ability to greatly reduce energy dependency in food production and achieve a degree of drought proofing. Australian sandalwood (*Santalum spicatum*) is a unique



Five year old sandalwood plantation.



Ripe sandalwood nuts.

continued on page 5

REVEGETATION

continued from page 4

Sandalwood

native tree crop highly adapted to Australia's harsh conditions. The tree produces nuts that are high in oil (60%) and protein (18%) with the kernel oil being largely monounsaturated (55%) - the healthiest of oils. It requires no nitrogen fertilizer inputs as it is hemi-parasitic on the root systems of Acacias, sourcing nitrogen needs that the host has fixed. This allows for a degree of biodiversity within the system that exists in no staple food production system in the world. The sandalwood nut will be an important dryland oilseed crop in the future

Trials for Australian sandalwood are underway at my farm east of Calingiri. I have been making selections from local trees for large-seededness and nut yield and have varieties whose nuts are as large as 29mm in diameter. Four year old trees in my plantings are yielding well in excess of 1kg per tree, with this yield set to increase as the trees mature further. A planting density of 300 trees per hectare in a 350mm rainfall zone, could lead to a conservative yield on a per hectare basis of around 300kg after 4 years. The major energy cost in this system is for weed control and harvesting, significantly below the energy cost of wheat production.

Plantings will continue on the farm, maybe we will become the world's first broadacre producer to achieve significant energy efficiencies in food production. Fifty hectares are earmarked for 2007 on top of the 30 hectares already established. Poorer soil types such as sands over gravel and areas prone to frost are being targeted first. These are the areas where energy investments in the form of fertilizer and herbicides are generally high.

Such oilseed crops as the sandalwood are essential to the future farm landscape. They will allow farmers to profit rather than pain from the energy market, to achieve energy self-sufficiency in food production and finally attain some degree of drought proofing in the production profile. My vision is to see significantly more plantings of this amazing production system throughout the Wheatbelt, other Australian southern dryland cropping zones and eventually arid regions around the world.

Aaron Edmonds can be contacted via www.australianuts.com

For more information about Sandalwood, contact the Secretary, Australian Sandalwood Network, ph: 9621 2400 or email: temmott@gawa.org.au