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SUSTAINABILITY OF ENERGY SUPPLY AND RESOURCES IN NSW

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Currently DEAs position on agriculture, diet and sustainability recognises the need for government to assist the agricultural sector to transition toward production that is resilient and also capable of producing adequate amounts of nutritious food for a growing population whilst at the same time minimising climate and environmental harm. At present agricultural reforms supported by the federal governments Carbon Farming initiative stand to not only mitigate some of the climate and environmental damage caused in this food production but also to create a valuable other commodity namely credible, reliable carbon credits which are increasingly in demand. As 58% of land in Australia is used for agriculture with 54% of this primarily for livestock feed and grazing, adoption of a system which encourages and rewards reforestation, regenerative agriculture, agroforestry practices and reduced methane and nitrous oxide production while at the same time producing an increasingly valuable trading commodity , namely carbon credits and nutritious non-toxic food a, is to be applauded. Support for the programme with minimal discouragement to its' adoption by cumbersome bureaucracy mandated by state and federal legislative requirements would be appreciated by those communities struggling to cope with the already heavy financial burdens of drought, flood and frost and social isolation as people are increasingly forced to move off the land . These difficulties are certainly decreasing the wellbeing significantly of our rural communities but the small amount of research that has been done on the benefits of regenerative agricultural techniques to Australian farmers particularly shows great promise in turning this trend around .

These initiatives in agriculture along with production of renewable energy from wind and solar farms largely in rural areas will provide not only environmental and climate benefits alleviating the public health risks associated with global warming and climate change for all but at the same time provide much needed jobs and revitalisation of small towns and communities where poorer mental and general health outcomes are often associated with residing in rural communities thought to be due in part to reduced employment opportunities and dwindling resources.

The Canberra based National Environmental Science programme report for example found that regenerative farming strengthened farmers sense of self-efficacy, financial resilience, and created more time off farm to spend with friends and family. Psycho-socio benefits included more optimism, reduced stress, and pride and enjoyment from seeing improvements to their landscapes. The report states, "wider adoption of regenerative farming could over the longer term reduce demands for current mental health services (which are being offered especially in drought/fire and flood affected areas) by reducing the numbers of farmers who reach a point at which they have mental health or other wellbeing associated problems that require intervention" http://www.canberra.edu.au/research/institutes/health-research-institute/regional-wellbeing-survey/survey-results/reports/2017-reports/Growing-resilience-to-drought-FINAL-23-Oct-2018-002.pdf

The Graziers with Better Profitability, Biodiversity and Wellbeing study echoes these results and includes measures of increased biodiversity of landscape as well https://www.vbs.net.au/wp-content/uploads/2019/03/Graziers-with-better-profit-

and-biodiversity_Final-2019.pdf. Ogilvy, S., Gardner, M., Mallawaarachichi, T., Schirmer, J., Brown, K., Heagney, E. (2018) Report: Graziers with better profitability, biodiversity and wellbeing. Canberra Australia. Regenerative grazing managers in this study had the following characteristics: • Significantly higher wellbeing than other similar farmers. • Were much more satisfied with their health, • Significantly more satisfied with their future security, • Happier with what they were achieving in life and their personal relationships. • Much less likely to report being in fair or poor health Overall, the results show that Regenerative Managers had significantly higher wellbeing than comparison groups of graziers.

It acknowledges that this is a small study but does make recommendations to government based on its findings namely supporting further development of the techniques such that larger scale validation and research will, with time, reproduce these advantages and hopefully build on them. A specific not for profit consisting largely of farmers who have/had been affected by drought has also felt this benefit and would prefer this type of government assistance (see https://www.carbon8.org.au/)

Government can greatly assist by ensuring that legislation around accreditation, monitoring and approvals is streamlined and aligned with the goals of decreasing carbon emissions, increasing and preserving biodiversity of not only natural habitat above but within soils and increasing carbon sequestration. Considering the large areas of land involved there is a lot to be gained from supporting and making this possible, not only for Australians and the environment as a whole (agricultural exports , more nutritious food , the reputation of our products and agricultural sector worldwide) but also for individuals and communities in the rural and remote areas of Australia whos' livelihoods and wellbeing depend on and are enhanced by sustainable production, stable climatic conditions and improvements to the land.

The population boom over the last century has seen demand for food grow and we have been largely able to feed that growing population. But the negative environmental impact of working to meet that need is undeniable – from greenhouse gases to waterway pollution, agriculture, in the midst of trying to feed the world, has also played a part in poisoning it.

With the world population projected to hit 10 billion people by 2050, requiring about 60% more food than we produce today, producing food that both keeps up with demand, and also meets the environmental and sustainable standards that the world demands, will not be easy.

IPCC special report on Climate Change & Land use points out the current situation and what needs to be done https://www.ipcc.ch/site/assets/uploads/2019/08/3.-Summary-of-Headline-Statements.pdf

Australian initiatives so far – The Carbon Credits Act of 2011 as part of the Carbon Farming Initiative http://www.cleanenergyregulator.gov.au/OSR/ANREU/types-

of-emissions-units/australian-carbon-credit-units enabled farmers to enter the carbon credit market.

By way of explanation -each ACCU (Australian Carbon Credit Unit) issued represents one tonne of carbon dioxide equivalent (tCO_2-e) stored or avoided by a project. An ACCU is issued to a person and registered in an account with the Clean Energy Regulator who administers the account, funding coming from the Emissions Reduction Fund. This legislation comes apparently in part from Paris agreement and Kyoto protocol. There is an agreement to create a carbon market and trade emissions for credits in the short term at least. 90 countries use carbon trading and there are at least 56 market schemes. Besides the government market therefore there is an international market for these carbon credits.

The federal government after the last election topped up the part of the scheme specifically designed for farming initiatives with a further 2 billion.

The various methods one can employ to qualify for the credits and their auditing process administered by the Clean Energy Regulator creates huge potential for employment, innovation in food production and reduction in waste, research possibilities and gains for Australian agricultural science, increases in food productivity, wiser and more efficient land use, greater carbon sequestration, biodiversity loss, fewer GHG emissions and increases in efficiency generally in food production.

Examples of five most popular methods –

1. Planting native trees and shrubs (Native Forest)

2. Reducing nitrous oxide emissions in irrigated cotton

3. Increasing stored carbon in soils

4. Managing stock to allow native forest to grow

5. Beef herd improvement – earnt by using proven methods to modify cattle herds and what they feed on to reduce methane emissions.

For more detail on methods go to https://carbonfarmersofaustralia.com.au/carbon-farming/available-methods/

Each of these methods addresses the issues summarised in the IPCC CCL report.

They also create employment opportunities in rural and remote regions and of growers for example by giving Landcare and other conservation services certainty and the ability to employ more coordinators and purchase greater stocks of native vegetation from suppliers. Planting more vegetation that again sequesters more carbon and provides habitat for greater biodiversity gain and less extinction of species while at the same time creating employment in restoration of native habitat is known to improve not only the surrounding agricultural land but also human health (see https://www.dea.org.au/wp-content/uploads/2019/01/Forests-and-native-vegetation-fact-sheet-Final-01-19.pdf for more information). Government support for Biodiversity credits administered

through the NSW Biodiversity Conservation Trust would be appreciated in this area of promise.

Knowledge about the importance of soil microbiology in carbon sequestration in soils and their importance to agricultural growing methods has led to a burgeoning industry in their production, use and research into this area. For Australian data see SoilCQuest, CSIRO. These are used along with soil conditioners based on biological formulations (made largely from farm and food organic waste)rather than high-analysis soluble fertilisers to improve soils in regenerative agriculture to improve carbon sequestration which in turn increases the water retention and absorption of soils. These techniques are associated with land restoration and combined with improved stock ratios and composition are helping to reduce methane and nitrous emissions associated with grazing livestock and crop production. Ultimately this enables farmers and the communities that rely on the agricultural industry to better withstand drought and adverse conditions and to keep and improve their assets and resilience to change, that will be essential in the years of climate change to come.

An emerging body of health research looking at the effects of current agricultural practices especially those associated with the use of widespread pesticide traditionally sown alongside seed and chemical fertiliser to kill weeds is finding that the same methods adopted in regenerative agriculture which encourage soil health rather than the use of pesticides which kill off concomitantly soil microbes (reducing subsoil biodiversity)may potentially be better for our health by reducing cancer risk, pesticide ingestion and causing antibiotic resistance https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2707948

HTTPS://ANNALS.ORG/AIM/ARTICLE-ABSTRACT/1355685/ORGANIC-FOODS-SAFER-HEALTHIER-THAN-CONVENTIONAL-ALTERNATIVES-SYSTEMATIC-REVIEW

The Carbon Farming Initiative also provides opportunities for innovation, technology and employment in the need to document activities and report them for auditing purposes. Take for example carbon soil testing necessary as proof of increased sequestration, drones that use modern technology such as infrared to document vast areas of vegetation allowing quantitative measures over time. This in turn allows farmers and other land users to better assess productivity and efficiency of methods and adapt techniques accordingly making them more productive and the carbon credits generated ultimately more valuable both in the domestic and overseas market for these which is rapidly expanding. Improved productivity and efficiency are known to be associated with overall wellbeing of farmers and their communities through economic benefits and sense of worth. Concurrently we build economic opportunities and innovation in information technology in the renewable and regenerative field which can be exported internationally.

These advances can also potentially support innovative new techniques which allow greater transparency in food production and provenance, something that consumers are increasingly demanding as they become better educated about the effects of food on their own health and that of the planet. Block chain technology and similar is rapidly being adopted and improved in this industry. Adoption of regenerative agriculture techniques will improve food quality and

these techniques will allow greater consumer choice. Increasing knowledge and experience of the effects of climate change is causing considerable anxiety about the effect of eating habits on both the climate and also thereby farming communities for many especially in the larger metropolitan areas. This technology could help to alleviate some of this and allow consumers greater say in how they manage their environment thereby reducing the helplessness and stress experienced by many knowing about climate change. Reser, JP, Bradley, GL, Glendon, AI, Ellul, MC & Callaghan, R 2012, *Public risk perceptions, understandings, and responses to climate change and natural disasters in Australia and Great Britain*, National Climate Change Adaptation Research Facility, Gold Coast, 298 pp.

These opportunities could be supported and enhanced by NSW government initiatives especially in rural and semi rural areas which are likely to be affected by the increasing efficiency of renewable power production and the lack of demand for coal. The Hunter Valley for example will need major rehabilitation as the mined land that was previously used for agricultural production has been degraded by mining and offers great opportunities in land regeneration for various forms of agriculture.

In addition, renewable energy production in rural areas is becoming a very important source of energy production at the same time boosting regional and rural economies and well being.

Wind farm construction has delivered an economic boost of almost $4 billion to regional Australia—over half of this in the last five years with current wind farm construction projects injecting a further $1.6 billion in economic activity into the regional economy. The two gigawatts of new wind farm capacity currently under construction have created an estimated 1,950 direct local jobs and a further 4,500 indirect jobs in local businesses that supply to the projects. Across the 25 year life span of Australia's existing wind farms and wind farms under construction, an estimated $10.5 billion could be delivered to host communities. Meanwhile, between $19 and $21.5 million goes directly into regional communities through payments to host landholders and wind farm Community Enhancement Funds (CEFs) every year. With fourteen more wind farms under construction, that annual figure will increase to between $30 and $32.5 million. From 2019, Community Enhancement Funds will make available $2.5 million annually for community projects. A diverse range of other benefit sharing mechanisms will see additional payments go to neighbouring landholders, local councils and community shareholders. If the 70-plus wind farms in the development pipeline are constructed, more than $7 million could flow into regional communities through CEFs each year.

The global movement away from fossil fuels to clean energy has gained momentum in recent years and will continue to drive Australia's wind energy sector for decades to come. At the end of 2016, Australia's 79 wind farms accounted for 5.3 per cent of the electricity generated nationally.1

By the end of the decade, an additional four gigawatts of wind capacity will have been added to the grid, putting wind farms on track to nearly double 2016's output and supply over 10 per cent of Australia's electricity. 2

1 Clean Energy Council (2017) Clean Energy Australia Report 2016 pp 54-55 2 Leitch, D. (2018) Australia's wind and solar projects: 2018 starts with a claret run. RenewEconomy. Retrieved from http://reneweconomy. com.au/australia-wind-and-solar-projects-2018-starts-with-a-claretrun-96222/. Australia's total wind capacity at the end of 2016 was 4,327 MW. A further 4,000 MW is in the process of being built by the end of the decade. With efficiency improvements and constant total demand, a contribution of over 10% from wind energy is likely.

(Information from http://www.windalliance.org.au/)

There are also several large scale solar farms creating jobs and income in regional areas including in Parkes (65MW), Griffith (36MW)Dubbo(24MW)Moree(56MW)Nyngan(102MW)Broken Hill (53MW)Gullen(10MW) These are well known to the NSW government . Rural communities could further benefit and in a number of cases already doing so, from the ability to produce solar energy both for on farm use and in localised grid systems . Take for example **Sundrop Farm Port Augusta SA**. **Entirely solar powered, uses distilled seawater and sunlight to produce 15,000 tonnes of tomatoes, worth $100 million annually. Covers 20 hectares and employs 220 people**

Effluent or manure from pigs in piggeries can be converted into biogas (a renewable energy source consisting mostly of methane and carbon dioxide), liquid fuel and/or nutrient-rich solids. Biogas can be burnt to generate electricity and heat, upgraded into a transport fuel (biomethane) and can yield other useful products. Using simple bacteria to break down waste in oxygen-free (anaerobic) conditions is a process called anaerobic digestion. Anaerobic digestion in lagoons or ponds is the most common method used to process piggery waste to create biogas

Currently operating are some very interesting and profitable renewable enterprises using methane emissions to produce biogas from abbatoir and piggery waste . ReNu Energy Limited and Southern Meats Abbatoir have a 20-year Power Purchase Agreement which involves a project whereby equipment is supplied such as an anaerobic digester, which is supplied with waste water from the abattoir, a biogas treatment plant, two 800 kW dual fuel Caterpillar generators and electrical interconnection to the abattoir which are used to generate electricity which is supplied to the abattoir at peak times of the daily billing cycle to reduce the facility's overall electricity costs. To be able to meet the peak demand periods, the generators can be operated on dual fuel, blending biogas with natural gas. Dual fuel blending is a novel and innovative application in the field of bioenergy, enabling projects to better meet the demand cycles of customers and enhance project viability through the addition of natural gas.

For further information use search bar in Australian Government Rural Industries Research and Development Corporation website.

Farmers also make good use of small wind turbines for example in producing energy for electric fencing necessary in intensive grazing techniques of regenerative agriculture. There is extensive use of solar energy for water pumps in irrigation and bore water use.

All in all , the agricultural sector is well placed and is already proving to be a major source and user of renewable energy production as well as providing opportunity for large amounts of carbon sequestration and emissions reduction. At the same time improving productivity and enhancing nutritional value of major food sources, much of which will be exported overseas as a major contributor to GDP. Providing employment opportunities in rural and remote locations through agriculture and renewable energy production will also help to save congestion/pollution/overcrowding problems in large cities and provide benefits to those already living in these locations.