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## **Ancient Australia: A land tamed by people and fire**

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### **Abstract**

This article explores the ancient aboriginal practice of using fire to condition ecosystems, in order to produce food production and procurement. Primarily concerned is the use of fire to create ash, which acted as fertiliser, along with rainwater, in order to bring consistency and change to vegetation, and therefore the animals that fed upon them, and the ancient aboriginals that fed upon vegetation and animals through foraging and hunting. Also considered are types of plants burned, for the purpose of producing specific types of ash as specific types of fertiliser, for specific types of plant growth. Considered throughout this article is the historical scenario that ancient aboriginals used these methods in order to deliberately manage the land, its vegetation, the animals that fed upon them, and the peoples that fed upon them.

**Keywords:** Ancient Australia, land tamed and people and fire

### **Introduction**

This article presents a historical depiction of the usage of fire for the purposes of the promotion, maintenance and alteration of edible sustenance throughout the continent of precolonial Australia, among ancient Australian aboriginals. Presented are a range of historical facts and argumentations that are brought together in one place, in the manner they are in this article, for the first time. These depict the culture of the ancient Australian aboriginals as one that breathed over time, with consistencies and changes in cultural norms that brought with them consistencies and changes in the ways fire were used by aboriginals to manage the ecologies of Australia, in precolonial times. Also, control and direction by aboriginals regarding fire-stick farming practices are also highlighted, revealing that aboriginals bravely and intelligently produced fires that helped to intentionally manage Australia's plants, to be ingested by animals, and thence by peoples - in terms of numbers and natures. Thus, fire-stick farming was one way to condition plant life, and thereupon animal life that fed upon it, and human life, which fed upon those animals. Thus, a primary purpose of this article is to explore the phenomenon that ancient aboriginals throughout Australia purposefully manipulated soil fertilization techniques, using ash and rainwater, in order to bring about consistencies and changes in their ecologies, and therefore among themselves. It is noted that this had a bearing on the maintenance of the health and wellbeing of many aboriginal groups, throughout Australia, as plants with medicinal properties were deliberately encouraged to grow. These were eaten by huntable animals, and these animals were, in turn, eaten by humans which could potentially improve in health and wellbeing, as a result. It shall also be demonstrated that such land and time management through use of fire allowed ancient aboriginals to spend less time hunting edible animals. For, through intelligent use of fire-stick farming, it could be predicted where and when such edible animals would eat the fresh vegetation growth produced by such intentional and concerted practices. Thus, though hard workers, precolonial Australian aboriginals were also intelligent workers, which suited the Australian conditions in which they lived. The result was a continent of well-managed resources.

### **Materials and Methods**

This article incorporates the finest modern scholarly works, and the ancient facts and traditions they derive from, and build upon, in order to produce a unique article that presents all of the synthesized relevant scholarly produced information in one place, in the manner this article is presented, for the first time.

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Included throughout this article are scholarly books and journal articles that present information relating either to Australia in its entirety, or to specific locales and regions in and throughout Australia, itself. These explore concepts relating to ancient aboriginal Australia, and the unique methods ancient aboriginals practiced to produce and procure food deliberately using fire, in directed and controlled manners. Also used is scholarship related to ecological and cultural consistencies and changes, which this article argues were deliberately used to result in consistencies and changes in vegetation, the animals that fed upon them, and the peoples that fed upon such vegetation and animals. Furthermore, scholarship with a basis thematically espousing the historical concept of the usage of fire to promote food production and procurement, in tandem and concert with good health practices through the same usage of fire, is also incorporated throughout this article, in order to highlight the brave and intelligent deliberate purposes utilised by ancient aboriginals behind such practices. Throughout this article, a historical approach is utilised, applying critical thinking, with philosophical sophistication tempered with scientific reasoning, underpinning the research and expression produced in this article, and the information, observations, findings, and conclusions it presents and espouses.

### Results and Discussions

Southeast Asian contact with northern present-day Australia extends back millennia. It is traceable as far back in history as the initial introduction of the Dingo to Australia from Southeast Asia from c.4, 500BC onwards. It further extends onwards to the burgeoning of widespread foundations of permanent and semi-permanent human settlements in and around the Torres Strait, which flows between Australia and present-day Papua New Guinea from 500BC onwards, with shared shell mounds along Australia's northern coasts dating from that time. It appears this trend spread throughout other parts of Australia from that point onwards. The oldest habitation sites in Australia have been discovered in Arnhem Land, in Australia's far north. This indicates shared human usage of northern parts of Australia in the first century AD, between Australian aboriginals and Southeast Asians from Papua New Guinea, and no doubt elsewhere in the wider local region, for the purposes of contact, networking, and no doubt friendship. For, contact and networking, and no doubt friendship, continued into later centuries as the introduction of the shell fishing hook to northern Australia from Southeast Asia further began around AD800, it appears. Thus, it is clear that a number of traders who used Southeast Asian ports with Indian and Chinese maritime traders, also traded various goods and services along northern Australian coasts for various bartering mediums and means. Indeed, Indian and Chinese traders may have been counted among their number<sup>[1]</sup>.

At times, ancient aboriginals from northern parts of Australia sailed with fishermen and merchants from the Indonesian archipelago to Macassar, and beyond. A number of aboriginals in ancient times even settled in Macassar, and the Celebes (now Sulawesi). A smaller number of these eventually returned to northern Australia, where they acted as useful translators, and mediators between Macassans, Yolngu aboriginals, and other aboriginal tribes. The Yolngu and other tribes traded tortoise shell and even buffalo horns for steel products, such as knives, and fabric items, with the

Macassans<sup>[2]</sup>.

Aboriginal habitation of Australia is known with much certainty to have lasted for the best part of the last 60,000 years. It is believed that by 12,000BC, most of Australia's arid interior, if not all of it, were occupied by desert dwelling aboriginals<sup>[3]</sup>. It is at times claimed that by the 1400s, Indonesian traders and fishermen more firmly established contact with the continent of Australia, and its unique peoples<sup>[4]</sup>. According to Clarke, by the 1500s to 1600s a fairly rigid pattern of clan and tribal territories existed across Australia, among its aboriginal peoples. However, the close links between lands and tribes, noticeable in the eighteenth and nineteenth centuries, became more flexible. Thus, aboriginal culture was a culture that breathed. There was a diversity of languages, and no overarching Australian Parliament, but several hundred small independent republic-like tribal ruling systems, among the aboriginal peoples, existed<sup>[5]</sup>. Aboriginal peoples were semi-nomadic, relying on base camp settlements and definitive trade routes, upon and throughout which they migrated, upon tribal, and at times inter-tribal, lands. In fact, aboriginal peoples often settled in one place at a time, for a long time at times, migrating in accordance with seasonal placements and harvests of vegetation and animals, throughout the year<sup>[6]</sup>. Thus, as Clark notes, the aboriginals of Australia exhibited remarkable 'intelligent adaptation to their environment', in this and in other manners and mannerisms<sup>[7]</sup>. The aboriginal population, at the time of first European colonisation, is difficult to estimate, but somewhere between 600,000 and 1,000,000 people is a good approximation, with perhaps between 500,000,000 and 600,000,000 aboriginals of Australia having lived throughout its history<sup>[8]</sup>.

Between 60,000BC and 40,000BC, Australia was blossoming with mega fauna that included giant kangaroos, wombats (about the size of buffalos), marsupial lions and tigers, and emus. However, local native hunting techniques, and the slow process of climate change, resulting in changes of food production, produced a mass loss of species whose viability was proving less and less sustainable over the millennia, and that included these mega fauna species. These changes helped see the demise of these larger animals and the rise of smaller ones, like present-day versions of Australian animals. This process of climate change may have been aided, and at times countered, by aboriginal groups in order to sustain, and at times alter the animal world of Australia. This helped with population size management, and as the population of Australia was stabilised, this eased strain on food supplies, over time, and gave a greater degree of equal access to the plenitude of digestible resources that blessed the land, the waters, and the skies<sup>[9]</sup>. Through population management, larger aboriginal populations conglomerated like brush-strokes, and dot-artwork, around Australia's river systems, allowing ease of access to food and drink, not to mention other people. Bush medicine was important, but it is estimated that without modern treatments, infanticide due to SIDs or euthanasia has been estimated at 30-50%, while a number of older people were also euthanized<sup>[10]</sup>.

### Hunting and Barter

While most ancient male aboriginals hunted larger animals, most ancient female aboriginals hunted smaller animals, and collected seeds, fruits, and roots. Women were highly

esteemed as a good barometer of a healthy community and society – the healthier and happier the women, by and large the healthier and happier the men, too. Usage of fire to manage ecosystems among ancient Australian aboriginals extended to women, as well. Larger fires warranted larger groups of aboriginal men and women to control and direct them. Smaller fires warranted smaller aboriginal groups of men or women to do likewise. Thus, as well as other divisions according to society and culture, gender divisions conditioned fire usage conditions. In Australia's western desert regions, men produced fires, as did women – constituting separate groupings, that combined to make a workforce including such groupings of men and women, brought together in order to produce larger fires, under such a combined workforce's control and direction. Hence, it is often recognised that more moderate and regular vegetation burnings eventuated among aboriginal males or females than combined male and female burnings<sup>[11]</sup>.

By the time of European colonisation in 1788, the divisions between tribal territories seemed to have existed since time immemorial. Religious and spiritual beliefs often grounded society. Animals, plants, and geological landmarks were believed to have been imbued with their own souls, thoughts and feelings. According to Clarke, even the land itself was imbued by its own soul, and souls of deceased<sup>[12]</sup>. As such, aboriginals did not own, or exploit, land according to European laws, or concepts. Instead, they often thought and felt themselves responsible for its care, as part of their relationship with it, and the souls interred under its soils and sands, in early (pre-colonial) aboriginal ways. Cultures were closely linked to geographical territories. Thus, they were in a real sense semi-settled, though semi-nomadic and pastoral. Widespread were beliefs that spirits of ancestors established territorial frontiers and limits. Tribes ensured and enforced laws together, and against others of other tribes at times. Sometimes, a death sentence resulted in familial, domestic stasis. This stasis was produced, and managed, by resolutions arising from tribal and inter-tribal trials<sup>[13]</sup>.

Most traditional aboriginal societies were introverted and peaceful, with healthy respect for customs and familiar behaviours, towards themselves and others. So, they maintained a sense of isolationist and protectionist trade that was used to alter inflation, and deflation, according to surplus and reasonable supply, respectively. Therefore, various slight variations existed within, and among, the localised aboriginal political systems. Of course, there were some prejudices, but also some exoticism concepts and beauty ideals that were passed on, and seemed real, from the heart, capturing the eye, and the imagination, of many a man and woman<sup>[14]</sup>. According to Clarke, within each tribe, there were up to, including, or slightly over three clans, or extended groups, that raised, harvested, and collected food for the tribe. These clans were judicial. They decided trade agreements, which included verbal contracts, arranged and presided over weddings, and defined and celebrated religious ceremonies, and rites of passage, like inductions and graduations, or initiations. Each clan could contain roughly up to 500 members each, while each one's Parliament included usually between 12 to 72 people<sup>[15]</sup>. Each clan and each tribe contained close, or distant, relatives. The more powerful, wise, and attractive men were often popular among beautiful, young women. However, because there were arranged marriages and recognised weddings, incest was minimalized, with little anaemia. So,

knowledge of blood, illness, and therefore medicinal food and drink was recognised throughout society<sup>[16]</sup>.

Aboriginal tribes were generally not inward-looking. Although they were often isolationist and protectionist in terms of trade, sometimes they were often more *laissez-faire*. Tribes came together for inter-tribal trade, and religious ceremonies. As a result, tribal and inter-tribal codes of conduct were observed, and enforced if need arose at those meetings. Legal arrangements could draw upon long-held precedents, similar to modern Australian legal and law-making proceedings<sup>[17]</sup>.

The aboriginal economy was based largely around subsistence and surplus food-usage. Ancient aboriginals often lived off meat, supplemented by vegetables including roots, yams and bulbs, as well as seasonal seeds and fruit. These retained bartering value, although they were consumed by aboriginals<sup>[18]</sup>. However, meat and vegetable products were also like currency, with barter methods based on quality and quantity. Therefore, not all aboriginal food products were for consumption. They were also meant for barter. With barter, inflation and deflation ensued, depending upon the deal and the amounts dealt, the quality and quantity of food products arising from weather patterns that helped create them, and the inter-tribal trade successes and failures at the time, and extending back years. Therefore, value and perceived value often depended upon quality and amount<sup>[19]</sup>. According to Clark, a predominant view among some historians is that Australian aboriginals possessed no grains for surplus crops, and no suitable animals to domesticate on a large scale. However, Clark has noted that such a view is flawed on the basis of its bias. For, as Clark has added, writings on aboriginals often mirror the subjectivities of the civilisations of origin of their respective authors<sup>[20]</sup>. In fact, as Clarke has pointed out, ancient aboriginals of Australia did maintain and sustain grasslands and other ecologies through fire-stick burning, and this had a marked effect upon the lives and deaths of many animals, throughout Australia. Thus, it may be argued that aboriginals maintained unique aboriginal methods of sustainable agriculture and animal husbandry, at times using what is called fire-stick farming<sup>[21]</sup>.

According to Mulvaney and Kamminga, fire had cleansing importance to many ancient aboriginals, and its use was one way in which aboriginals could cleanse the landscape, in honour and obligation to their sacred ancestral spirits, on whose behalf they stewarded the land<sup>[22]</sup>. Fire also possessed intermediary importance to many Australian aboriginals between the realms of the living and the dead. At Lake Mungo in western New South Wales, cremation remains from as early as c.24, 000BC have been discovered, denoting fire's role as a means of metamorphosis between the physical and the spiritual worlds. Thus, cremation held special importance to many ancient Australian aboriginals<sup>[23]</sup>. Also, as Clarke notes, through the use of fire and other techniques, tribal territories were managed well, which produced change at times throughout local ecologies over a period of years, throughout Australia. The use of fire to exploit and utilise the plethora of resources of tribal, and inter-tribal territories, expanded grasslands, attracting grass-eating animals from those same territories – perfect for the purposes of raising, herding, and harvesting in enclosed tribal areas, for meat and other products. Burning continued until the forecasted rain arrived, after a predetermined period of dry weather<sup>[24]</sup>. As Preece notes, in monsoonal

northern Australia, burning commenced over the warmer months, after the end of the last heavy rains. Rains during cooler months prevented further burning <sup>[25]</sup>. Thus, inland Australia once contained far more Australian bush. However, through the use of fire, many of the more closely associated combustible trees were burnt and died away, minimising more harmful spontaneous bushfires and making room for new, fresh grasslands to take over the landscape – which further attracted more herdable meat to suit the landscape. Eventually, many of these grasslands gave way to more barren wilderness, like soily and sandy rocky desert areas over a period of time, as these grasses were over-consumed and under-fed <sup>[26]</sup>. Of course, where and when aboriginal groups desired more bush, and less grasslands, they simply ceased for a time from the usage of extensive, coordinated fires in thoughtfully considered areas <sup>[27]</sup>.

### **Taming the land through use of fire**

By the time of British colonisation of Australia in 1788, aboriginals had long tamed the Australian landscape through usage of fire. Throughout the island continent, dense forests were cleared using fire, giving way to large eucalypts punctuating shrubbery and grasslands, including around Port Jackson (present-day Sydney Harbour). These were necessary in order to direct the flow of the feeding habits of animals in various regions across Australia. This allowed aboriginal groups greater ease when it came to hunting. For, with consideration of animals like kangaroos and emus feeding at certain places at certain times of the day in a predictable manner, aboriginal hunting parties were thereby able to waste less time in hunting the animals they needed in order to feed their families, and other associates <sup>[28]</sup>. Thus, even by the time of 1836, Charles Darwin was even able to observe the partial uniformities of vegetation from place to place around the Australian continent <sup>[29]</sup>. Furthermore, as Thomas Mitchell noticed in 1848, the vegetation and animal worlds of Australia were often alterable, and maintainable, along desired lines by aboriginal groups, including through the use of fire. He observed that fire was used to clear tracts of forests to make way for grasslands in order to promote various herdable animals in those areas. These were often suitable for hunting and eating. Furthermore, he found that the use of fire in this way was conducive to clearing the landscape of vermin, including rats, fleas, and mosquitoes <sup>[30]</sup>.

This was an important way to clear the land and its peoples of a number of transmittable diseases. Data from Bangladesh and Pakistan in modern times has revealed that following rains, stagnant pools of water can attract such vermin for consumption and breeding purposes, and these can spread infectious diseases throughout the animal and human populations that come into close contact with them. However, through the use of fire, aboriginals in ancient times were able to nullify the effects of such vermin as carriers of disease that could infect potential hosts, including humans <sup>[31]</sup>.

Recognisable bacterial life appeared around 3 billion years ago, and their descendants are still with us in various forms. Of course, a life form can build resistances to an illness, and when this occurs, it cannot change such a survival tactic once it has been mastered, or mastered the body. Bacteria are centres for many metabolic reactions, from respiration to photosynthesis to digestion. Therefore, they are also centres

for naturally occurring antibodies and antibiotics against viral infections, and breed, live and die in larger, more complex bodies of life forms, including those of human beings. These may increasingly include Covid-19 strains, even today <sup>[32]</sup>. Today, diseases are often isolated in laboratories. However, societies continue to thrive despite the plagues of the past, including those not just of humans, but also rats, mosquitoes and fleas, indicating that these too, in cases can build up resistances to such illnesses if the specimens are healthy, and thus produce naturally occurring antibodies and antibiotics, as well. In this world, despite the plagues and pandemics of the past, when these animals acted as hosts and carriers of the contaminants, rats, mosquitoes and fleas still exist. The antibodies and naturally occurring antibiotics in the healthier specimens – of these and other life forms - might be diluted in their bloodstreams, but they can stay the course, making them, at least partly, resilient to various diseases and viruses. In the meantime, we should be inoculated against COVID-19 until effective antibiotics and other treatments are developed, in order to save lives – and even then, prevention can be better than the cure <sup>[33]</sup>.

It appears that during an elongated period of time, relatively soon after aboriginals arrived in Australia - between roughly 60,000BC and 38,000BC - aboriginals began to change their environment to suit their tastes for the above purposes through the use of fire, throughout Australia. In fact, as Keneally notes, fire-stick farming in Australia extends back as early as aboriginal habitation in Australia, itself <sup>[34]</sup>. Dense forests were cleared, making way for more open spaces of grasslands, and this resulted in the decline of various species of mega fauna, in favour of more moderate sized species - more suitable for hunting and carrying to places of eating. This cultural norm in ancient aboriginal life at times held importance in relation to climate change. As Clark notes, at the end of ice ages in Australia, mega fauna often died out. For, in tandem and concert with fire-stick burning, rivers began to run dry, and inland lakes often dried up as well, denying such mega fauna of precious sources of fresh water, and the vegetation that grows alongside such waterways, for their sustenance. As such water sources became barren of water, vegetation and animals had to compete more for sustenance resources, and a result was that many plants and animals simply died out for lack of fresh water, especially in inland parts of Australia. Thus, as ice ages ended throughout Australia, there was less mega fauna for aboriginals to hunt, for their own sustenance <sup>[35]</sup>.

Still, as Keneally points out, aboriginals did continue to hunt and eat such mega fauna, on a fairly substantial basis, according to seasonal availability, or lack thereof. At Cuddie Springs, in northwest New South Wales, remains of a mega fauna *Diprotodon* have been discovered. The remains of this massive wombat-like mega fauna species, appear to have been part of a mass-meal for a number of ancient aboriginals, and have been dated to c.30, 000BC. Nearby, were also discovered grindstones or querns, for milled grasses and other types of vegetation? Clearly, these were used by the same tribe and that which hunted, and ate, the *Diprotodon*. These implements have also been dated to c.30, 000BC <sup>[36]</sup>. However, given the apparent limitations of ancient aboriginal hunting technology, it appears improbable that Australia's mega fauna was exterminated in an over-hunting enterprise by ancient aboriginals <sup>[37]</sup>.

As the soils of the once forested areas became less fertile, the ash from fire-stick farming, accompanied by predictable rains, allowed the soils to be fertilised, to an extent. As Flannery relates, the result was soil which was able to sustain grasslands and shrubbery. This allowed for predetermined consistencies and changes not only in the types of vegetation available for herd able animals to consume, but also for consistencies and changes within those very same animals. These phenomena influenced the human beings who consumed those same plants and animals. This was one way that Australian aboriginals were able to purposefully direct the flow of life throughout Australia. They altered the structure of vegetation throughout the landscape, and thereby the animals that fed upon them, and as a result, thereby the humans that fed upon them as well <sup>[38]</sup>. Over time, many Australian plants became dependent upon aboriginal usage of fire. In fact, numbers of plant foods in the central desert regions, including the Bush Tomato and the Desert Raisin plants become scarcer in the absence of fire. Thus, the continent of Australia, including the central desert region itself, was an artefact of the Australian aboriginals upon British colonisation in 1788, through management of the land, its plants, animals and humans, across Australia <sup>[39]</sup>. In fact, Australia – from the western desert regions to the southeast parts of the continent – was what some historians call the ‘artificial wilderness’ that was the general ecology of the continent, due to cultural fire practices among precolonial Australian aboriginals, that altered the face of Australia so much, it could hardly be seriously considered wild wilderness by many precolonial aboriginals, and even numbers of British settlers from 1788, onwards <sup>[40]</sup>.

While it is entirely possible that mega fauna died out as a result of such transformations in the ecology of Australia – for their apparent extinctions by those means occurred over the same period of time – it is also possible that aboriginals had a hand in altering the sizes, shapes, and perhaps colours of various animals in order to suit their eating tastes, and perhaps hunting tastes. These animals may arguably have included at least some species of mega fauna <sup>[41]</sup>. For, as Rindos has noted, the domestication of animals is a ‘coevolutionary process’ that establishes a ‘symbiotic protection and dispersal relationship with the animal feeding upon it’. Rindos and Christian add, this results in changes in appearances of vegetation and animals, as well as their behaviours. Furthermore, through the scattering of seeds, this coevolutionary process is facilitated. In the Australian case, fire promoted the growth of fire-resistant vegetation that reproduced via seeding aided by fire. Thus, one may argue that aboriginals were able to alter, and maintain, the appearance of animals and humans through the use of controlling vegetation species with fire, to suit their own socio-political needs and requirements <sup>[42]</sup>. However, at other times, ancient aboriginals were able to control numbers of smaller animals through more extensive burning. For, more extensive bushfires in Australia’s tropical savannas reduced in numbers smaller fauna, and fire-sensitive vegetation types. Thus, in order to stimulate larger species numbers and reduce those of smaller animals, ancient aboriginals could create, and at times control and direct more intense, larger fires. In order to produce healthier populations of people, aboriginal groups burned areas, and scattered seeds deliberately, that allowed numbers of types of plants to grow, which held beneficial medicinal

properties for health and well-being. Once these plants were ingested by animals, these same animals could then be hunted and eaten by peoples, potentially resulting in better health results, among them. In addition, flowering plants with medicinal properties could grow amidst fire-stick farming conditions, in order to be used by bees to create honey. Of course, if these medicinal flowers were edible, they could be ingested themselves for medicinal purposes. However, for a sweeter and therefore perhaps more palatable alternative, whereby the medicinal properties of the flowers were perhaps diluted in the honey, such honey could be ingested, instead. The more flowers that blossomed in an area, produced by burning and seed scattering by local aboriginals, the higher the rate of bee numbers. By these means, ancient aboriginals could potentially produce more honey. Such honey could thereupon be ingested by peoples, in order to flavour meals and potentially produce better health results in ancient aboriginals <sup>[43]</sup>.

### **Fire and Water**

With ancient aboriginal methods of agriculture and animal husbandry, production among aboriginals of fruit, vegetables, grains, and meat produced currencies of goods. This produced unique and tasteful economic policies, of the tribes’ very own. With such fire-stick farming, land and water features remained tribal and clan boundaries. These were sometimes markers with variations, based on weather patterns and climate change. This often produced offers, and usages, of inter-clan and inter-tribal help with relation to fire-stick burning and food production. As a result, there was a quality sense of work, in tandem and concert with good, steady rains, including in spring, in many parts of Australia. In addition, there was also widespread sharing among ancient aboriginals pertaining to food production, and food consumption <sup>[44]</sup>.

Fire-stick farming served by rainfall was very efficient over large widespread terrains, like Australia’s. Grasslands burned well as fire spreads, especially under windy conditions. New shoots, and tender green grass grew among numerous species after fire and good rainfall, which attracted many animals, including kangaroos and wallabies. Fire eradicated closely positioned timber forest ferociously. As a result, fire-stick farming created conditions to make grasslands and other ecosystems more fire-resistant to out-of-control unplanned bushfires – but at the expense of fire-prone species largely incapable of adaptation to fire and intense heat and smoke. Early colonial pastoralists also discovered that fire and rain were conducive to preparing areas of land very well for cattle, sheep and other livestock farming, especially with regards to raising, breeding, and herding. In this way, they acted in much the same way as ancient aboriginals who raised, bred, and herded kangaroos, wallabies and other species of animals. Fire-stick farming was also conducive to the cultivation and harvesting of numerous types of Australian native cereal seeds, vegetables, and fruit found today around Australia’s land areas. In parts of southeast Australia, in order to maintain vegetation species growth and diversity, intervals of burning an area of land were observed by Australia’s ancient aboriginals. In order to reduce such results, a greater frequency of burning ensued in Australia’s ancient past. Grounded into powders and pastes, not to mention marinades, sauces, and drinks, for cakes, breads, and other food products, or eaten in more natural conditions, including

raw, these foods possessed nutrients and minerals that fostered flavours and good health, since much of Australia's food had been used for sustenance and bush medicine <sup>[45]</sup>.

Therefore, careful use of fire to fertilise the soil over wide areas, with ash and rain, sustained organically produced crops over those same very wide areas – given the right crops were planted in the right soil, and given appropriate geological and weather conditions were in effect. In fact, these were used to carefully control the paths and lifespans of fires. Therefore, such fires minimised damage to clans, tribes, and lands. Forests and grasslands were reserved for aboriginal production and markets, as traders used their products as currencies for barter. Grasses in both were encouraged to suit herded animals' diets. New shoots were conducive to the sustenance of kangaroos and wallabies, while longer shoots are usually more conducive to the sustenance of cattle and sheep. Thus, with grasslands controls, thoughtfully chosen animals were raised according to soils, terrains, and climates. As trees burned out, eventually they died, including species over much time as they became more and more extinct. However, grasslands were capable of expansion under those conditions, given timely, healthy rains. But, over sparsely populated areas, grass dependent upon fire, ash, and rain died out without them, leaving grasslands depopulated of grass, and leaving them to become desert-like areas. Still, regeneration of animals and plants after fire and rain in their seasons occurred, and reoccurred, given lapses – especially those not too spaced apart <sup>[46]</sup>.

As Bowman has noted, fire-stick burning and farming among ancient Australian aboriginals suited the mostly dry Australian climate, especially in the dry season during the continent's warmer months. For, dry vegetation produced excellent natural fuel for directed and controlled ancient aboriginal fires, for the purposes of fertilising the soil with ash in order to produce foraging vegetation that huntable animals ate, which were eaten by ancient aboriginals <sup>[47]</sup>. According to Fensham, fire-stick farming was stratified in parts of Queensland according to vegetation types and seasons for fire. Thus, fire was more effective with certain plants over others, at certain times of the year. In fact, spring and summer human-produced fires were dependent upon types of winter and autumn vegetation fuel growth in specific, and thoughtfully considered locations and areas. If a specific type of ash fertiliser produced from a specific type of burned plant was required to fertilise the soil, ancient aboriginals burned relevant areas of land where that plant was prevalent <sup>[48]</sup>. This, and growth from seeds through use of natural growth, seed scattering, and use of predictable rains, helped ancient aboriginals produce specific types of vegetation, and particular types of habitat, where specific plants grew at specific rates, in predictable manners. In this manner, ancient aboriginals constructed their own ecosystems for the purposes of intentional, and dependable, foraging practices <sup>[49]</sup>. In central Arnhem Land, most fires were ignited in the second half of the dry season, from August to October, in anticipation of the coming wet season rains to further control the fires, and put them out, after a period of directed burning along fire-stick farming lines, for the purposes of preparing and fertilising the soil, for new growth to eventuate and continue, for the purposes of aboriginal production and procurement of foods <sup>[50]</sup>.

Kohen adds that burning methods and locations shifted in practice over periods of time in southeast parts of Australia,

but such burning was still often purposefully controlled and directed <sup>[51]</sup>. With consistencies and differences in weather and vegetation fuel conditions in southeast Australia, various types of fires were lit, controlled and directed. Low-intensity high-frequency burning regimes were often used by Australian aboriginals. However, at other times, when the vegetation fuel was more evenly dispersed, more intensive burning eras in Australia's precolonial past emerged and gained cultural credibility, and at times, duration <sup>[52]</sup>. Cultural consistencies and changes also determined consistencies and changes in fire-stick farming practices, from place to place, over time, in Australia's tropical savanna regions <sup>[53]</sup>. Furthermore, when faced with a resources shortage projection, detected through foresight, fire-stick farming practices were utilised by ancient Australian aboriginals in order to stimulate fresh vegetation growth, partly in order to provide more edible vegetation, and partly in order to attract edible animals to predetermined areas of land, for the purposes of hunting <sup>[54]</sup>. Still, despite such variations in fire-stick farming practices over time, ancient aboriginals used controlling and directing techniques to at times limit the extent of fires, in order to curtail and even fight the realisation of potential cataclysmic fires to various populations of plants, animals and humans <sup>[55]</sup>.

Too much fire and aridity led to delayed growth in reproduction amongst a number of species. Therefore, shock occurred among them, and in cases, death. Controlled fire-usage and farming, with added appropriate fertilisers like ash and rainwater, helped produce fire-suited plants' reproduction, and therefore, animals' reproduction. Therefore, through such methods, less shock occurred, and in cases less death. Closely timbered fires were generally much more large-scale and destructive. More open-timbered fires were generally more small-scale, and less destructive, in terms of geographic area. However, this favoured certain species of animals and plants in the diets of ancient aboriginals. Therefore, in aboriginal Australia there were loyalties towards diet ingredients in terms of clans, tribes, and inter-tribal networks <sup>[56]</sup>.

### **Culture and Cultivation**

There is no known evidence of European-style cultivation of plants on a mass-scale, in ancient aboriginal Australia. However, Indonesian rice, yams, and coconut varieties were cultivated along European lines throughout the Indonesian archipelago, and these grew well in many parts of northern Australia. Indonesian fish, rice, yams, and coconut growing, raising, breeding, and harvesting is often naturally productive, even in the wild, in numbers of environments and eco-systems of Australia. Still, there seems to have been a deliberate attempt to choose, throughout ancient aboriginal Australia, not to openly embrace a European-Indonesian agricultural way of life, generally speaking <sup>[57]</sup>. Instead, there was usually several hours spent hunting, fishing, and collecting food a day, usually by a number of clans within tribes employed to gather these goods. This was often sufficient to supply a single day's needs and wants food-wise, and at times more. Therefore, clan shift work lengths were at times standardised. Still, this work was not required everyday if foodstuffs kept or were preservable. But, such work continued everyday if clans and tribes wanted surplus stock to trade with. This, of course, depended upon availability <sup>[58]</sup>.

According to Clarke, European observers in exploration and colonial times tended to equate godliness with hard work. However, the definition of hard work was dependable upon shift lengths, numbers of shifts, and intensity of work required. If conditions were easier, or conducive to quality hours of leisure, that too could be a blessing. Thus, there was differentiation between Australia and the Indonesian archipelago among early (pre-colonial) aboriginals. Still, there was a balance between hard work and good bodily health. Of course, there was not always surplus and excess stock in parts of Australia on a consistent basis. Therefore, there were no towns or cities in a European or Indonesian sense, or empires in a European or Indonesian sense. Still, this meant there was not intense large-scale inflation or deflation in prices of bartered food and other goods as a result over short-term periods of time. Furthermore, with quality management of the ecologies of Australia, ancient aboriginals could afford to spend less time hunting. For, through hard work they managed the lands, in order to hunt animals whose movements were often predictable, based upon how those ecologies were managed through various techniques, including the usage of fire. Thus, despite the short shifts they at times employed for hunting, ancient aboriginals worked hard to manage the land so that hunting would indeed be easier, over short shifts <sup>[59]</sup>.

According to Veth and O'Connor, ancient aboriginals built elaborate fish-traps that helped supplement the fire-stick farming food production industry among them. Therefore, fisheries in southeast Australia, including in southwest Victoria, using lakes, dams, rivers and creeks as reservoirs for reserves of eatable fish were utilised, as were front-line products of freshly caught fish, with others kept in reserve uncaught in order to preserve stock, retain value, and make fishing and waterway industries (along aboriginal lines) more sustainable, lucrative, and of a high and manageable, and at times extremely affordable quality <sup>[60]</sup>. Coastal populations of aboriginals depended largely on what the sea left to them, as well as interior lands influenced by fire-stick farming. In these areas, and others of course, old and young people were given much food, especially so they could eat in common, including at aboriginal banquets. Thus, elderly and youth welfare payments existed in forms of food distribution. This eating in common fostered sharing, friendship and family. Banquets for special occasions including birthdays, career landmarks, rites of passage, annual events of lunar or solar natures, and Parliamentary-like decision-making meetings were dependent upon the availability of much or little <sup>[61]</sup>.

As Clarke points out, small-scale farming was disinclined among many early (pre-colonial) aboriginals, according to early European observers. However, aboriginals clearly knew about European and Indonesian styles of farming, and agriculture, and animal husbandry, especially in northern Australia. But, it appears they chose instead, by and large, their own traditional styles of food production and acquisition to suit the conditions – and to benefit bodily health, at times. Small-scale farming was not always conducive to mass-food production in Australian conditions. But, it could be in parts of Australia, especially if incorporated into overarching policies and food patterns. Small-scale farming could be more labour-intensive to get the most out of the localised Australian soil. Thus, ancient aboriginals used geographical, geological, animal, plant, and human differentiations to direct the flow of local ancient

aboriginal economies, policies, tribal territories, and the tribal, inter-tribal, and national standards for good health <sup>[62]</sup>.

## Conclusion

This article has demonstrated that through hard work, bravery and intelligence, Australia's ecologies were admirably managed by ancient Australian aboriginals, throughout Australia. Consistencies and changes in relation to cultural norms, weather, vegetation fuel, and food requirements over time brought with them consistencies and changes in fire-stick farming practices, that were intended to bring with them sustenance and plenitude to Australian plants. Through consumption of such plants, this brought about sustenance and plenitude of animals, and also the peoples that consumed them. With climate change, hunting practices, and alterations in fertilisation techniques, precolonial Australian aboriginals observed, and at times partook in, consistencies and changes in the appearance of various plants, and hence the animals that fed upon those plants, and the peoples that fed upon those animals, as the general ecosystem of Australia accommodated Australia's aboriginals, and its aboriginals accommodated it. Thus, the product was a well-managed continent, in terms of its resources and people that often depended upon fire in order to live and prosper, and survive and thrive.

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