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NOVEMBER
2023

WHY COULD REGENERATIVE AGRICULTURE BE A SOLUTION? The *Chianti Classico* model

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Brian Chatterton, former Minister of Agriculture in South Australia and farmer in Umbria (Italy)
David Dent, former head of the World Soil Association
Martin Keulertz, Lecturer in Environmental Management, University of the West of England, Bristol

Industrial agriculture delivers cheap food at high cost in terms of degraded land, water resources, biodiversity and rural societies. It exacerbates floods and droughts, and creates enormous greenhouse gas emissions. There is an alternative: *regenerative agriculture* that mimics natural ecosystems, holding to four rules: no bare soil, no tillage, a diverse crop rotation and a rough landscape that includes woods and wetlands. Subsidising regenerative farming is politically feasible whereas, probably, taxing land degradation is not.

Farmers may be encouraged to adopt regenerative farming through small changes to the EU's Common Agricultural Policy (CAP) whereby farmers could form Landcare Groups which would develop a regenerative farming brand – analogous to a protected name such as *Chianti Classico*. They could then sell their brand to a regional Sustainable Farming Panel and, if authenticated, it could receive a subsidy under the CAP.

The cost of food

Food prices and food security are existential issues for governments as well as consumers. Since the early 19th century, governments have had to grapple with the competing claims of farmers, manufacturing and popular interests. In the UK, the repeal of the Corn Laws

in 1846 was a victory for popular interests. Since then, most governments, most of the time, have left the food system to the market and food prices have been driven down – notwithstanding wartime spikes and oil-price shocks. Society has been comfortingly deluded that the food system works. It delivers cheap food to consumers but stresses farmers and degrades the land. Governments nurture the delusion, hide the harm by buying off the farmers and ignore the erosion of natural capital. *But the system doesn't deliver cheap food: it delivers underpriced food.* The real price is being paid by underpaid labour, the taxpayer and degradation of soil, water, biodiversity and climate stability. None of these is accounted for in the price of food.

Governments subsidise farmers to support livelihoods, maintain rural economies, guarantee a degree of food self-sufficiency and protect landscapes and ecosystem services. This last intent is reinforced by compliance conditions, but the bar has never been set very high; this is an area of policy making where the state is learning on the hoof (Allan and Dent, 2021: 3-20). The subsidy model has two tracks. Payment by results was an early policy of the European Union (EU) Common Agricultural Policy (CAP). Farmers responded to the incentive and the outcomes included the butter mountain and the wine lake; cheap credit for big machinery and grants for ripping out hedgerows created more environmental damage. Nowadays, subsidies are shifting to activities: areas reserved for birds and bees receive a subsidy whether or not they are endorsed by the birds and the bees – the activity, not the result, entitles the farmer to financial support. Our proposal to support *regenerative farming* – exemplified here by the *Chianti Classico* model – is also based on activities because the results are too complex to assess and don't provide a tangible target for farmers.

The need to relearn the last 70 years

For decades after the end of the Second World War, farming was flooded with cheap fertilisers and miraculous agrochemicals. Fossil fuels were cheap; the military-industrial complex sidestepped adroitly from explosives to fertilisers, from poisons to pesticides; plant breeders developed responsive new varieties. Together, these gifts of technology created the much-trumpeted “Green Revolution” that, in favourable situations, tripled the yields of staple crops.

Favourable situations are unequally distributed so, simultaneously, we saw globalisation of the food system and relocation within individual countries. One of the authors of this essay, Brian Chatterton, lives on an abandoned farm in Umbria (Italy) where sharecroppers, the *contadini*, deserted a life of labour and poverty for paid work in the prosperous north; and livestock were abandoned because there were no herdsman. A century earlier, in one of the authors’ country of origin, in Australia, when farm labour joined the gold rush, farmers introduced fences to control their livestock. Fences were not introduced in Italy; instead, the livestock moved to feedlots – not just a move away from grazing but, also, to make use of the great global

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grain surplus. In the process, manure was converted from a fertiliser to a pollutant. The gifts of technology came with other calamitous consequences – climatic, ecological and social – and the industrial inputs are now expensive and likely to remain so. As a result, an unsustainable situation has been created.

There is an alternative to this nonviable process. Over the last 70 years, *regenerative agriculture* has emerged as a farmers’ movement, without fanfare, and has been adopted across 15% of the world’s cropland, in particular in North America and Europe.

What is regenerative agriculture?

Regenerative agriculture is the antithesis of the “Green Revolution”. It emerged under the banner of “Conservation Agriculture” (Kassam, 2020), but the aim is not preservation of what remains of soil, water and biodiversity but building back better by mimicking natural ecosystems. Here are its four rules:

First Rule: “Ban Bare Soil”. Bare soil invites invasion by weeds. Every year, they must be rooted out, the

soil turned and we start again – with bare soil. Bare soil bakes in the sun; so do earthworms and myriad smaller creatures that should be maintaining soil permeability. Rain splash turns bare soil into mud – mud that clogs the pores so that rainwater ponds or runs off the surface, carrying the soil with it. When the rain stops, the pulverised surface sets as a crust that yields immediate runoff from the next rainstorm. And bare soil is carried off by the wind: three-quarters of the topsoil and three and a half million people left the Dust Bowl of the American Plains states in the 1930s. The rule is: don’t fallow and, between crops, keep the soil covered with a mulch of crop residues. This keeps it cool, arrests soil erosion, and allows all the rain and snowmelt to infiltrate.

Second Rule: “Don’t Plough”. The purpose of ploughing is to control weeds. Weeds can be controlled by crop rotation without resort to poisonous chemicals. Ploughing uses 60-70% of the energy (labour and diesel fuel) consumed in agriculture – and stimulates germination of more weeds. Worse still, it perturbs the soil’s physical and biological structure and promotes the breakdown of soil organic matter – the fuel of life in the soil, the glue that binds soil structure, and which holds more carbon than the atmosphere and

all standing vegetation put together. Centuries under the plough have drastically depleted soil organic matter. Stop ploughing, and a net loss of soil organic carbon is transformed to a net gain that draws down the carbon dioxide concentration in the atmosphere; and direct drilling leaves the soil surface protected by crop residues.

Third Rule: “Adopt a diverse crop rotation”. Natural vegetation is diverse and mostly perennial. Recent advances in crop breeding have brought the yields of perennial cereals and oilseeds within touching distance of established annual varieties (Crews, *et al.*, 2018) but, until they are truly commercial, the next best thing is to follow a diverse crop rotation that includes perennial grasses and legumes – both as crops and pastures. Under this rotation, yields of cash crops are greater than any alternative monoculture; integration of crops and livestock makes good use of the additional biomass; and the costs of fertiliser, herbicides and pesticides are cut if not completely eliminated.

Fourth rule: “Create a rough landscape”. Restore wetlands and woodlands. Plant windbreaks. Windbreaks are shirts for fields; allocation of 4% of the land area to windbreaks brings a benefit-cost dividend of 10% through lower air temperature, greater humidity, cutting wind speed, retaining snow and runoff, arresting erosion and increasing biodiversity.

Moreover, the increased surface roughness creates convective rainfall; and the transpiration of trees and other perennial vegetation, drawing on deep water reserves, promotes the local water cycle and a more habitable landscape.

Regenerative farming is commercial: It is a good livelihood, not the fantasy of a wealthy philanthropist. Regenerative farming is profitable but not obsessed with crop yields because greatly reduced costs and risk contribute to profits as well. Rather, it is possessed by sustainability: meeting the needs of the present without compromising the future. For instance, for several generations, the Chatterton farm in South Australia grew two wheat crops in succession after two or three years of poor pasture grounded on ephemeral grasses. Changing the poor pasture to a protein-rich sward of annual medick immediately improved soil fertility – though not wheat yields because weeds benefitted as well. Costs were much lower, because nitrogen fertiliser was eliminated, and sheep numbers increased from 500 to 1,200 (and the sheep were better fed). The whole system was more productive, more profitable. Regenerative farming can also be intensive as the Chinese, Koreans and Japanese demonstrated for millennia (King, 2004); intensive production requires intensive regeneration and that is what they did.

Regenerative agriculture is not anti-science: It doesn't reject all the progress made in the last 70 years. It doesn't reject disease-resistant crops and thousands of other scientific advances. It does reject the view we learned at university, half a century ago, that the soil is merely a neutral growth medium and everything else the plant needs can be supplied by the chemical industry.

Regenerative agriculture is not nostalgic: We are not advocating ox-drawn ploughs or the return of poor sharecroppers. Some farmers will adopt old crop varieties provided that there is a market for them, but the concept is not to turn our back on scientific advances. If they really are advances, adopt them. Brian Chatterton, for instance, inherited a farming system that burnt any remaining stubble before drilling the next cereal crop and, so, further reducing what was already a low soil organic matter content. We have no wish to return to this destructive practice.

Is regenerative farming the same as organic farming? No. They are not the same although they are moving in the same direction. They cater for different markets. Organic farming eschews industrial chemicals like artificial fertilisers, pesticides and weedkillers so as to satisfy the concerns of the affluent who are anxious

about chemical residues in their food and are prepared to pay a premium to avoid them. From the farmers' point of view, organic farming requires a great deal more capital, both monetary and human, and the market premium depends on organically grown food being a niche product. Both organic farming and regenerative farming replace chemicals with knowledge, but organic farmers have to make this investment for several years before they attain organic status and qualify for the price premium. Those years without the price premium, nominally to rid the system of industrial residues, are also needed to master the alternative organic farming practices – for instance, controlling pests without industrial pesticides.

In the EU, wider uptake of regenerative agriculture will depend on subsidy from the CAP, which we would call *payment for environmental services* – services that include arresting soil erosion, delivery of fresh water, moderation of floods and droughts, and cutting emissions of greenhouse gases. We assume that the market will not reward farmers who provide these services, so a CAP subsidy will be invaluable during the years of adoption and adaptation to acquire the necessary skills and the equipment.

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Why should regenerative farming be adopted?

To arrest soil erosion: Archaeological evidence shows, for instance, that soil erosion in central Italy during the last 70 years has been greater than the previous 2,000 years of recorded farming history. The erosion map of Europe (Panagos *et al.*, 2020) confirms that Italy has more soil erosion than any other European country. It has hills and mountains but so do other European countries; and if erosion continues at this rate, we can no longer count the future of fields in decades. But soil erosion is arrested by a complete vegetation cover, as practised by regenerative agriculture. Stopping soil erosion is the main reason given by farmers, worldwide, for adopting regenerative farming: they want to stay in business and pass on a productive farm to their children.

Direct cost of current system: The war in Ukraine has pushed up fuel prices and, in turn, the price of fertilisers. For farmers, these costs have been offset to some degree by an increase in farm gate prices – which have

fed through to higher costs for animal feed – but farm gate prices have fallen away again. Prices depend very much on what the international commodity traders decide is in their best interests: the farmers will have no say. Farmers must pay on the nail for their inputs, but their outputs are at risk from world prices and the weather. No-till farming obviously makes a big saving, not just in fuel, fertiliser and pesticides but in wear and tear and tractor power requirements.

Carbon footprint of fertilisers and their further pollution: Manufacture of nitrogenous fertiliser requires a lot of energy and its nitrogen-use efficiency is commonly less than 33%. These fertilisers are readily leached, contaminating streams, groundwater and drinking water; and their breakdown in the soil releases nitrogen oxides – with 300 times the greenhouse effect of the equivalent amount of carbon dioxide. As temperatures rise and droughts intensify, emissions will increase.

To regulate water supply, control floods and droughts: Continuing with the case of Italy, this country faces several water crises but they all stem from the state of the soil. The first requirement is to catch the rain

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and snowmelt. Under nearly all circumstances, a well-protected, well-structured soil will infiltrate all the precipitation it receives. If there is no runoff, there is no flooding and no sedimentation of streams and reservoirs; the soil stays in place, where we all need it to be. Vegetation or, failing that, a mulch of crop residues protects the soil surface from sun, wind and rain; and enhances soil structure – that is to say, the architecture of the pore space that holds and transmits water.

To increase soil organic matter: Soil structure is held together by soil organic matter; the more organic matter, the more resilient the structure. Soil organic matter is also the primary source of plant nutrients, which are steadily released by microbial decomposition under the very same conditions that growing plants need – not in a rush as with artificial fertilisers, so losses by leaching are minimal. Soil organic matter increases under regenerative agriculture because there is more biomass and less decomposition under more equitable soil temperatures, the absence of intensive soil disturbance, and without periodic erosion of the topsoil.

Cultivate less: Cultivation accelerates the breakdown of soil organic matter which releases the nutrients it holds, so the ploughing of virgin soils provided bumper yields. But yields crashed when the humus was not replaced.

Under the current conventional farming system in large parts of Europe, the land is ploughed deeply using powerful tractors that burn a lot of fuel. Ploughing buries the weeds and stubble left from the previous crop but, at the same time, destroys soil structure and permeability and creates a pan at the plough sole that needs even deeper cultivation to break it up. Having used a lot of energy to upend the soil, the farmers have created fields of hard clay bricks that require yet more power to smash them down into a reasonable seed bed. Farmers need to acquire different machinery and use it differently.

As a first step, they shouldn't turn everything upside down. Leaving crop residues on the surface protects the soil from the elements and supplements soil organic matter; but increasing soil organic matter also means retaining all crop residues rather than selling bales of straw to livestock farmers. As soil organic matter

increases, soil structure improves; the clods will crumble and require less force to create a seedbed. It follows that tractors do not need to be so big and heavy; sowing can be undertaken at the optimum time; autumn rains will be more effective; and undisturbed soil enables

mycorrhizal fungi – old friends of higher plants – to proliferate their slow-growing hyphae throughout the soil profile, absorbing and passing on otherwise hard to get nutrients like phosphate.

Grow legumes: Sustainable farming also needs legumes that fix their own nitrogen fertiliser from the air and, in turn, release the nutrients for intercrops or other crops in rotation.

Bring back grazing: There is little interest in improved pastures in mainland Italy, although there are such legume pastures in Sardinia. A similar situation prevails in much of Europe. Perennial lucerne, *erba medica* in Italy, is very productive but hard to incorporate into a cereal rotation. The advantage of legumes in grazed pastures or leys is that more of the nitrogen fixed by the plants is retained and the biomass, returned as manure, is spread for free. Animals on feedlots are fed on imported soya and grains grown using chemical fertiliser, and their manure is not conveniently recycled.

Retain stubble: A decline in feedlots will also cut the market for straw. Leaving the straw in the field will

increase soil organic matter but cereal straw is poor in nitrogen. Microorganisms breaking down the straw take up nitrogen from the soil, in competition with growing crops, so it can pay to add some pump-priming nitrogen fertiliser or a commercial stubble bio-decomposer. Once the straw has rotted, the nitrogen is available again.

How to encourage regenerative farming in Europe?

Society needs regenerative farming as much as the farmers do – but the market will not pay for it. If we follow the subsidy track, payment by results might be attractive but practical and ethical issues immediately arise. What should those results be? How can they be proven? For instance, we might pay according to improvement in ground cover, soil bulk density and soil organic carbon (easy-to-measure proxies for soil health) (Dent, 2019). But the starting point has to be determined; in the case of soil organic matter, it varies from very low in sandy soils to very high in swamps, and may vary by an order of magnitude within any field. This means a lot of tests. The feasible rate of increase is similarly variable and depends as much on the weather as the farmer; and the gain declines as the soil attains a new equilibrium. When the effective ceiling is reached, is the farmer to be paid simply to maintain it? And is reimbursement to be enforced if it is not maintained, for instance following a change of ownership?

We are proposing an alternative, socially well-proven and familiar model based on farmers' actions, not outcomes. It builds upon voluntary associations of farmers that have been the bedrock of regenerative agriculture as a farmers' movement across six continents, such as the *Clubs Amigos da Terra* in Brazil and the Landcare movement in Australia.

The Chianti Classico model

The *Chianti Classico* model is an alternative, a socially well-proven and familiar model based on farmers' actions, not outcomes. It builds upon voluntary associations of farmers. *Chianti Classico* is just one among thousands of similar protected names for wine, cheese, ham, etc. throughout Europe that follow similar rules. Essentially, a group of winemakers cooperate, not to make the best wine – that is a matter of fierce individual competition – but to eliminate substandard wine in the expectation that the market will reward them with a higher price. We are proposing local Landcare Groups on similar lines but, since the market will not reward them for farming more sustainably, the new groups will pitch for CAP subsidies.

Each group will propose a plan for sustainable farming; a combination of the elements described above appropriate to their circumstances – a plan for the eroded hills of the Val d'Orcia will be different from one for the floodplains of the Chiana, just as Orvieto Classico Superiore is different from Chianti Classico. The group will then add a timetable for implementation and submit the plan to the competent authority for disbursing public funds to support regenerative agriculture. We propose the establishment of a Sustainable Farming Panel for each regional funding body to evaluate these plans. The panel can score the plan on, say, a five-point scale. If the plan is accepted and according to the score awarded, the farmers will receive an annual payment for a period of up to three years to implement it. Payment will be in advance because the costs of change are immediate while the returns and cost savings take time. Most of the payment will be to individual farmers within the group, according to the area proposed for regenerative farming, but 20% may be paid to the group as a whole for education and training, perhaps outside assistance, or as a bonus to members who already have experience of regenerative practices and can serve as mentors.

Regenerative farming brand: implementation plan

What is a Landcare Group? Like *Chianti Classico*, it is a legal entity. This is important because the group will be handling public funds. The group is also making promises as a group to the Sustainable Farming Panel. While it is not the same as *Chianti Classico* and other protected names it should not be difficult to draw up an appropriate legal framework on similar lines.

The Landcare Group is not a cooperative, as each farmer farms and sells produce separately. Cooperatives may be formed within the group, particularly for farm machinery, but they are quite separate organisations. The Landcare Group is defined by its objective, which is to maintain a certain standard of regenerative farming.

The standard that the group must meet is the standard they put forward in their proposal to the Sustainable Farming Panel, accepted by the panel as sufficient to entitle them to a certain level of subsidy, and subject to review by the panel. For example, a level 1 subsidy may require a 25% reduction in nitrogen fertiliser application and tractor fuel use. Maintaining this standard will entitle the group to the subsidy and this standard will be maintained, firstly, by group action. That is, the group will tell the individual farmer that certain farm practices must change, and they will help to make those changes. Anyone who consistently fails can be expelled but, usually, help from within the group will enable a member to reach the standard.

How is a group formed? It may be through existing local farmers' groups, through the encouragement of an accountant or farming adviser, and other ways. Obviously, it needs a commitment to a certain level of sustainable farming. The group is also a source of knowledge that can help other farmers but, if the foundation group is diluted, the core group may be held back as it tries to move up the sustainable farming scale.

Guidance on proposals: The Sustainable Farming Panel needs to issue guidance on its priorities for a certain region. For example, the Val d'Orcia in Tuscany is a crisis area for soil erosion, so the guidance will say that proposals must tackle soil erosion as their first priority. It might also suggest measures to improve soil structure such as increasing soil cover and soil organic matter and selective tree planting. This guidance will help groups to formulate their proposals, but it is important to emphasise that the concept is not rigid: guidance is only guidance, not a set of rules.

Judging proposals: Over several decades, funding authorities have adopted the competitive approach of the marketplace. If a group of people, or a *commune*, applies for a subsidy for a new road, a community centre or a theatre group, they will compete for the available funds in the knowledge that funds are limited and not all projects will be funded. The funding authority will receive a suite of well-presented proposals, but the system imposes high costs and risks on those seeking funds: in our case groups of farmers.

Farmers need a high level of optimism to be farmers, but they often have a high level of pessimism when it comes to dealing with government agencies. Farmers seeking to become Landcare Groups should not be burdened with extra presentation costs and risks. Moreover, we, the community, want to reduce the climate impact of farming, need to combat floods and drought, need farmers to change. We don't have unlimited funds but must not make the system too expensive and too complicated for farmers.

Facing a similar problem in South Australia after three years of severe drought, many farmers lacked the cash or credit to sow another crop. The government wanted them to sow the crop because agricultural output was important for the state's economy. So, it provided low-cost loans, but it had to be prudent. Farmers had to provide information to prove the legitimacy of their needs but, as minister of agriculture, Brian Chatterton developed a simpler system to provide a first-step or provisional approval that gave the farmer a strong incentive to provide all the additional information needed to complete the approval. Not one approval was rejected in the second round because the farmer had made the initial application with false information.

With this experience, we suggest that a Landcare Group should put forward a proposal in general terms which can be discussed with an Assessment Officer employed by the Sustainable Farming Panel. The officer can then give advice and point out how the proposal needs to be framed to gain approval. From that point, the Landcare Group can be reasonably assured their proposal will be accepted and will have a strong incentive to go ahead and work up the detailed proposal, which would still need to be endorsed by the Sustainable Farming Panel to maintain consistency between the Assessment Officers and to allow proposals that are outside the guidance to be considered. Of course, the bureaucracy would prefer fully complete proposals that can be approved or rejected at one meeting, but the more cooperative approach reduces the risk for the Landcare Groups and, thereby, will bring more of them on board.

Monitoring Landcare Groups: Countering land degradation and climate change is imperative so we need to get funding to farmers urgently; the necessary farming changes will take several years to be fully effective. At the same time, we cannot afford to expose millions of euros to fraud.

The first and principal means of enforcement is self-assessment. Our experience of self-assessment of the quality of named wines¹ suggests that producers are willing and able to make tough decisions to maintain standards. Voluntary systems policed by consent have always proved to be more popular and more effective than command and control. Official checks are, of course, practicable using satellite imagery and, in detail, using UAVs. For example, farmers may promise to tackle bald patches or gullies that can easily be seen and measured on satellite imagery. For examination of actual crop species, an inspector can make a reasonably detailed examination of the cropping pattern of a whole farm in less than an hour using a UAV, and a complete Landcare Group could be checked in a couple of days; but self-policing will be the norm.

Cost savings – to the administration: Assessing thousands of individual applications for a regenerative farming subsidy would require a considerable administration, which will be much reduced if farmers apply in Landcare Groups. The groups will be subject to periodic review, not as individual farmers but as groups. Over time, the group might move up the scale or, if they fail to meet their promises, move down; but policing of any

1. In the case of *appellation d'origine contrôlée* (AOC)/*denominazione di origine controllata* (DOC), nearly all the winemakers in the district, as well as some officials, conduct tastings to establish if they are good enough to bear the all-important name. The wines are awarded a class 1 or 2 which is advisory and has no legal standing. Wines that fail class 2 are graded as Unacceptable. Examination of the voting figures reveals that many wines graded 1 or 2 receive votes of, perhaps, 55% in favour and 45% against but, when it came to the Unacceptable grade, there is not a single wine with less than 90% vote to reject. So, producers are quite capable of making the tough decisions needed to maintain standards.

individual's adherence to the conditions of the payment can be left to the other members of the group. Members of the Landcare Group cannot avoid assessing their neighbours, but the impact is not so drastic as with the exclusion of a wine from the *Chianti Classico* label.

Cost savings – to the farmers: It is important to consider the cost and risk to farmers in making an application especially if a paid intermediary is employed. The *Chianti Classico* group approach cuts the cost per hectare and shares these costs among several farmers. Over time, costs are reduced further as farmers join existing Landcare Groups.

In the 1960s, European farmers demonstrated that they could change their farming system and produce more food by responding to incentives provided under the CAP. At the same time, these changes also harmed the environment. The farmers will change again if they are offered the appropriate incentives to adopt regenerative farming. The *Chianti Classico* model is a practical means to do so.

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