Round-up of non-food crop activity in the UK: cosmetics and pharmaceuticals

Introduction

Crop biomass will play an instrumental role in the world's transition towards industrial decarbonisation and the phasing out of fossil-resources. Bioenergy, and its associated technologies, has become a popular investment for governments and industrial stakeholders, and political agendas are aligning themselves with the development of biomass-derived innovative methods for the production of transport fuels and the generation of heat and power. In December 2020, the UK Government published its Energy White Paper outlining the country's pathway to reaching its 2050 Net-Zero target. In this report, bioenergy is part of the overall Net-Zero innovation portfolio[i], showing that biomass feedstocks are likely to benefit from a lot of support in the future.

In the UK, the area dedicated to growing crops for bioenergy reached a peak of around 130,000 hectares in 2016 and 2017. The latest available statistics, dating back to 2019, show that this area has since decreased to below 100,000 hectares (equivalent to just under 1.6% of all available arable land in the country)[ii]. Further statistics show that 20% of this land area was dedicated to biofuel (bioethanol and biodiesel) production, the rest being directed towards power and heat generation.

Beyond bioenergy, there are many other applications for crop feedstocks, beyond food and feed production. Non-food crops, when grown in a considerate manner, can offer a wide variety of services and products, ranging from restoring soil health to serving as raw materials for textile manufacturing, cosmetics and medicines. Compared to fossil resources, which are often used as raw materials for such similar products, non-food crops provide alternative solutions which cut down on overall greenhouse gas emissions. Non-food crops can also provide socio-economic benefits through the establishment of local industries and the development of new markets[iii].

Beauty products and plant-based remedies have been around for a very long time. Plant-based cosmetics, often made from fruits like berries, were often used to apply colours to the skin, while natural oils and creams were applied to the skin and hair as protection against the sun. Historians and archaeologists have found traces of such practices dating as far back as 10,000 BC in Egypt[iv]. Similar practices were found all over the world, including in China and Japan where citizens would use rice powder to whiten their skin. The cosmetics industry truly became the global market that we know it as today during the 19th and 20th centuries, when modern machinery and capitalism came to prominence[v]. Although there is evidence that individuals from as early as the Palaeolithic Age (c. 60,000 BC) used medicinal plants, and that books on medicinal plants were written in Ancient China around 2,500 BC, the earliest recorded use of "recipes" for the production of herbal concoctions and drugs dates back to 3,000 BC in Nagpur, India[vi]. The 19th century saw the beginning of "scientific pharmacy" at which point medicinal compounds began being extracted, synthesised and isolated. This was the start of the pharmaceutical industry as we know it today.

This article aims to summarise which non-food crops are currently being grown in the UK to serve the pharmaceutical and cosmetics industries, with a particular focus on oilseed crops and herbs.

What is currently grown in the UK?

In 2017, the UK recorded a "cosmetics boom" during which the country's cosmetics market reached an all-time high of £9.8 billion. Although this value has been volatile ever since, it has not dropped below £9 billion[vii]. This recent unprecedented rise in cosmetics demand is also increasingly accompanied by a demand for "eco-friendly" products which do not contain fossil-derived hydrocarbons. This presents researchers and industrial stakeholders with many opportunities to innovate and expand.

The global pharmaceutical market is on a constant increase and has reached a value of $1.3 trillion in 2020, up from $890 billion just 10 years prior[viii]. The UK pharmaceutical market is following that trend, and in 2018, the annual turnover of pharmaceutical goods wholesalers in the UK reached £48 billion[ix], showing a £20 million increase in only 10 years. There is a large and growing global demand for herbal medicines which has the potential to lead to an increase in farm-grown raw materials. In 2019, the European dietary supplement market reached a value of $15 billion and is expected to grow to about $34 billion by 2027[x]. Although this is one specific market within the wider herbal medicine industry, it still provides clues as to the overall herbal pharmaceutical market trends now and in the future.

These rising markets, along with the rising demand for sustainable products, present an opportunity for the UK. A rich variety of non-food crops have been identified (or re-popularised) as being able to provide sustainable alternatives to a range of petroleum-derived products and chemicals used in both the cosmetics and the pharmaceutical industries. Currently, several non-food crops are being grown in the UK, however only a few are destined to serve as feedstocks for the production of medicines and cosmetics, with others predominantly destined for the bioenergy market. The main opportunities at present, aside from crops grown for fuel and energy, are predominantly oilseeds and herbs aimed at higher value applications. Furthermore, crops grown for construction pose significant and growing opportunities, but this sector has not been covered in this article.

Oilseed crops

Oilseed crops include a wide variety of plants and nuts, some of them very well-known and widely used by consumers globally. Some popular examples include soya beans, sunflower, rapeseed, sesame, coconut and the controversial oil palm. These crops have become popular due to the high nutritional benefits that they can provide as they are often rich in protein, essential amino acid and polyunsaturated fatty acids which are all beneficial to human health[xi].

The value of these crops mainly resides in the vegetable oils which can be extracted from the seeds and which have become an instrumental ingredient for the production of food products, but also for the manufacture of commodities such as biofuels, fibres, cosmetics and pharmaceuticals.

As a result of the growing popularity of seed oils, oilseed crops have acquired a non-negligeable share of the global products markets. A market outlook study produced by the European Commission projects that global production of oilseed crops will reach 633 million tonnes during the 2021/2022 financial year. Only about 30 million tonnes of which will be produced within the EU[xii], which leaves the EU outside of the Top 5 producers in the world. The three most grown oilseed crops are soya beans, rapeseed and sunflower, with soya leading the way by a very large margin. The share of oilseed crops grown in the UK remains very low, however, and seems to be decreasing further. In 2020, the UK recorded a production of 1 million tonnes of oilseed rape, which represents a 41% decrease in harvest due to both a 28% reduction in land area use and a reduction in yield[xiii]. The area used for oilseed crops in the UK was about 415 thousand hectares in 2020.

Although it is far from being the largest producer of oilseed crops, the EU is the second largest importer of oilseed crops, along with being the 5th biggest producer of protein meals and the 4th biggest producer of vegetable oils.[xiv] With vegetable oils being used for such a wide range of applications, it is difficult to establish the exact share of the market dedicated to the cosmetics and pharmaceutical sectors, however, the vegetable oils market seems to be on the rise globally. The essential oils global market is expected to reach a staggering $27 billion by 2022[xv]. The rise in vegetable oils demand is also partly attributed to the establishment of a number of national and international biofuels quotas, such as REDII in Europe[xvi].

Some examples of oilseed crops being grown in the UK are sunflower, hemp and linseed. In 2009, the UK produced 3,000 tonnes of sunflower seeds which were destined for national use and for exportation. At present, the global market for sunflower seeds is estimated at $23 billion and is on the rise. Similarly, hemp is being produced in the UK, with a total of 12 licenses having been issued as far back as 2014 for the cultivation of hemp and hight THC Cannabis. The global market for hemp is estimated to currently be between $600 and $800 million while the global market for high THC cannabis can only be roughly estimated to be between $10 to $120 billion. In addition, the global market for hemp (and cannabis) oil is currently valued at $28 million. With multiple nations relaxing regulations concerning the use of hemp and cannabis for medicinal and recreational uses, it is expected that the relevant markets will increase and that many opportunities will arise in the near future. However, hemp is widely grown for its oil which is used in both food and non-food applications. Linseed production has been declining in the UK over the past few of decades due to a reduction in market price, with sources reporting that land use area in the UK for linseed production reached as much as 200,000 ha in the 1990s[xvii], only to fall to around 11,000 ha in 2007. However, numbers appear to be on the rise again and oilseed land use area was recorded at 35,000 ha in 2020. The linseed oil market was valued at $720 million in 2016 and is expected to reach $930 million by 2025[xviii].

Herbs

Herbal medicines can be produced from a range of plant materials, including flowers, fruits, seeds, bark, gums exuded from trunks, roots and leaves. Medicinal herbs can sometimes be very common and popular plants which are being used globally for a range of purposes, such as cooking. These can include herbs such as rosemary, ginger and thyme. The healing properties of medicinal herbs are as varied as the herbs themselves, and can include pain relief, anti-inflammatory, anti-bacterial, anti-oxidative, nausea relief, and many others[xix].

Herbal medicines include raw herb (dried or fresh), tinctures (an infusion of herbs in alcohol), and extracts (solvent-extracted products). Herbal medicines are produced by direct extraction from whole plant material without further purification other than filtration. They generally contain a large number of constituents and active compounds possibly working in conjunction with each other, rather than a single, isolated active compound.

Around 90% of plant medicines are still wild harvested, with a range of associated problems that impact on users' safety and the environment. New regulation for production and supply of mixed herbal extracts is in place and has created an opportunity for cultivation of endangered species in the UK, potentially. However, the introduction of the Traditional Herbal Medicines Directive in April 2011 meant unlicensed suppliers were no longer permitted on the market, and this reduced the scale of opportunity for local production. Europe is a major player in the medicinal plants industry: 70% of the 40-50,000 plant species used in herbal remedies worldwide are wild-crafted (20-30,000 tonnes per year from Europe, alone). Around 4,000 of these species are on the brink of extinction. Only 130 plant species are

cultivated in Europe (between 70,000 and 100,000 ha), and less than 500 species are cultivated world-wide.

Despite the discovery of new synthetic medicine, which have been incredibly effective over the past century, the demand for herbal medicine has not decreased as dramatically as could be expected, especially in developing countries, which still heavily rely on traditional medicine for primary care (i.e. 90% of the population in Africa and 70% in India)[xx]. However, they are signs that demand for natural remedies in Europe is increasing and that this demand is mainly driven by the ageing population.

Examples of herbs grown in the UK for medicinal or cosmetics applications include Camelina, Evening Primrose, poppies and borage. At the moment there is no industrial production of Camelina in the UK but it is estimated that 1,000 ha could safely be dedicated to it according to current demand, and it was grown commercially a decade ago, for domestic processing and use. UK Evening Primrose production remains undermined by Chinese production, however the global market for the herb was valued at $170 million last year, showing that there are still opportunities to consider there. Poppies occupy an important place within the global market with an estimated value of $206 million. Poppies have been grown in the UK for commercial medicinal purposes since 2002 with great success and appear to have become a valuable element of crop rotation systems for a modest number of farmers. Borage, an oil-based herb used for its medicinal properties, has been grown in the country for years and remains at a stable 7,000 hectares of land use area, proving to be a robust and economically viable investment.

Conclusion

Despite the global rise in oilseed crops and herbal production, along with the popularisation of sustainable and plant-based alternatives to petroleum-derived conventional products, the UK seems to be experiencing a reduction in land area dedicated to growing such crops.

Many of the non-food crops succinctly presented above are perennial plants or rely on unique production or harvesting methods, typically delivering low yields and although they are suited to the UK weather and climatic conditions, the risk associated with their production is relatively high compared to more traditional crops. As the public gain's insight into the bioeconomy and the environmental benefits of plant-based products, increasing demand is leading non-food crops to becoming more popular and to their global trade becoming more profitable, so further growth in the UK could be expected.

In 2022, the Government will publish its Biomass Strategy which will no doubt provide extensive information on the role that non-food crops will play in the country's journey to net-zero. Carried ahead further by Europe's and the UK's wish to transition away from food crops for the production of biobased products, non-food crops will likely benefit from growing governmental support in the years to come.

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