Poppies - a specialist Tasmanian crop

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Introduction

In this paper we shall explore four areas: 1. **why** poppy should be grown in Tasmania, 2. background to the crop and development of the industry in Tasmania, 3. current problems and developments, and 4. a summary of the lessons learnt in relation to **future** specialist crops.

Australia cannot often compete successfully against northern hemisphere countries in terms of efficiency in agricultural production. However Tasmania offers ideal conditions for the production of low-volume high-value agricultural products. Apart from technical skills and equipment to compete with the world, relatively small volumes of product can be shipped without excessive transport costs; costs which often inhibit Australia from competing with more bulky products.

Essential oils have been described elsewhere and are well suited for production in and export from Tasmania. Another example is the oil poppy. The poppy industry is now worth about $10M annually in direct earnings within Tasmania or about $30N in indirect earnings.

1. Why poppy should be grown in Tasmania

The Need for Poppy - Why Grow the Plant?

Oil poppy (Papaver somniferus) produces many alkaloids of which morphine and codeine are most important. These alkaloids are used chiefly for killing pain. Codeine derived from morphine is widely found in tablet and hospital use. These painkillers have been used for a long time and the poppy domesticated for centuries. The poppy also produces seed which has been used as a food for numerous generations in many parts of the world; particularly in Eastern Europe.

To understand why Glaxo should grow poppy it is necessary to appreciate that Glaxo is a world-wide group of companies and one of these companies has specialised in providing plant-derived chemicals since 1832. The morphine alkaloids are amongst the range of products supplied by Glaxo.

Why Grow in Tasmania?

Morphine supply from traditional countries had often been unreliable, and the Glaxo group had found a stable supply of crop difficult to obtain. The company set out to identify more reliable growing areas where it could have greater control over supply. Initially, trials were undertaken in the U.K. but the climate was too poor for growth and the frequent wet summers hampered harvesting. Australia was a politically stable country, and Tasmania provided suitable climatic conditions, viz spring rain with high sunshine hours and hot, dry summers.

Early Trials in Australia and New Zealand

The selection of Tasmania followed four years of trials in Australia. In the years 1960-64 trials were undertaken in N.S.W., S.A., W.A., N.Z. and Tasmania in regions where good climatic conditions had been identified. The combination of reliable climate and good soil type culminated in future trials being restricted to Tasmania. Poppy grew particularly well in Tasmania on the krasnozem soils which were high in organic matter and well drained but only if the pH was > 5.7. Grey soils of low pH were thus avoided.

2. Background to the crop and development of the industry in Tasmania

The Poppy Plant and its Current Crop Life

Before we discuss agronomic problems in the development of the poppy industry, we will digress briefly to review the poppy plant and its current crop life in Australia.

Papaver somniferum is an annual herbaceous plant which grows from small seed. About 200O seeds weigh 1 gram. Et is sown commercially in Australia from late August to early September through a modified seed drill. The plant grows slowly at first, develops a rosette and, after some six weeks, the flowering stems elongate and the plant grows rapidly. Flowering occurs in December and alkaloid levels peak within the following 40 days. The plant is harvested when a stable storage moisture level is attained, generally in February.

Most of the alkaloids are contained in the capsule fruit although some occur in the uppermost section of stem. The seed contains no alkaloid and can therefore be sold for human consumption.

Early Problems in Tasmania

The anticipated problems of pests and disease did not plague the early work in Tasmania. However, weed control using mechanical hoeing techniques proved difficult on the clay krasnozems, although the method had been successful for poppies grown in Europe. En time these obstacles were overcome. Nechanical weed control was replaced by selective herbicides. This in itself allowed narrower rows to be sown; thus the crop could shade out late germinating weeds.

Harvesting with headers was also a problem, particularly in north west Tasmania, where the humid afternoon sea breeze did not allow stems to break. readily. Harvesting problems were overcome by the development of modified forage harvesters.

Recruiting Growers

Commercial production of a novel crop requires contract growers, and in the early years of growing poppy it was difficult to recruit these growers. The crop was new to the State, some agronomic problems still remained unsolved and it was difficult to set an attractive contract price. GlaDo Field Officers were employed to canvass growers, convince them that poppy was a worthwhile proposition and to assist the grower to obtain a harvestable crop.

With an increasing world price for morphine sufficient growers were attracted, crops were harvested and confidence in the industry grew. Gradually the standard of grower and cultivation increased and the less efficient areas were reduced by Glaxo. The industry was then set with a stable supply.

Secondary Agronomy

After gaining the initial hectares to start growing poppy on a commercial scale and solving the major problems of weedy paddocks and mechanical harvesting, attention was concentrated on (i) determining optimal fertilizer rates and methods of application, (ii) the correct density and (iii) the optimal sowing date. Much of the information had to be obtained over many years to show convincing patterns.

Cultivar Improvement

Concurrent with agronomic R & D a breeding programme was successfully running and provided cultivars which had been painstakingly developed, assessed and adapted to perform best under Tasmanian conditions. This comprehensive programme involved (i) maximising standing ability, (ii) selecting for uniform canopy height, indehiscence and seed colour, and (iii) increased alkaloid yield. All potential cultivars were assessed at several localities before they were released for commercial use.

Crop Handling and Extraction

In developing a novel crop, handling facilities must be established. In 1970/71 the Latrobe factory was opened to receive crops, to separate seed from straw, to clean and package seed and to reduce the bulk density of alkaloid-containing straw for shipment to Port Fairy in Victoria. The agronomic development of the crop was paralleled by original research in extraction technology. En 197O/71 a new plant was opened by Glaxo at Port Fairy where there was an infrastructure based on a previous milk drying plant.

With these crop handling and extraction facilities the crop production area was able to expand to meet demand. Today this has consolidated as uneconomic soils and areas were discarded. As the prime areas for poppy were identified, rotation patterns developed and poppy fitted into programmes involving pea, pasture, onion and potato crops.

By-Product

Apart from alkaloid production, the poppy industry supplies a by-product viz poppy seed which may be used for cooking, bird food or vegetable oils according to the grade. Tasmania offers excellent quality blue seed and also supplies fresh seed to markets in the northern hemisphere at times when other fresh supplies are unavailable. The poppy industry in itself has earned Glaxo two EDport Awards viz 1977 and 1983, for its sales of alkaloids and poppy seed.

3. Current problems and developments

Fine Tuning - Continued Research and Development

Having painted a story of success, agronomic problems still develop and require continued research. This work is principally continued in plant breeding and control of weeds and diseases.

The support of the Tasmanian Department of Agriculture is invaluable in their areas of technical excellence, particularly the work on plant density, irrigation and nutrient levels.

The cultivar improvement work continues to progress with breeding sites covering c. 1.5 ha and numerous cultivar assessment trials located in the poppy growing regions of the State.

Weed and disease control programmes also show response to our research and economic benefits for the industry.

Weed Control

Early crop losses between the time of contract and harvest was often attributable to inadequate weed control. Improved weed control has given higher yields and in turn attracted better growers and therefore even higher yields.

The change in the percentage of controllable weeds common in poppy paddocks can be subdivided into five groups (Table 1) which relate to major changes in weed control strategy resulting largely from original research and development by Glaxo.

Table 1 - Effects of Changes in Weed Control Strategy

	1967	1969	1970	1977	1981
Common Weeds					
(a) Controlled/Uncontrolled	5/15	10/10	15/5	16/4	20/0
(b) % Controllable	25%	50%	75%	80%	100%
Relative Crop Yield	100	119	126	139	168

Common weeds difficult to control selectively until recently were: large hogweed - Polygonum aviculare; large wild radish - Raphanus raphanistrum; large fat hen - Chenopodium album; large hedge mustard - Sisymbrium officinale.

In the 1980's, weed control is still being refined and improved upon. A three stage strategy is adopted by Glaxo, viz: (i) good land preparation - to minimise perennial weeds; (ii) timely and accurate chemical applications; (iii) follow-up crop growth stimulation - water and nutrients.

Good weed control during poppy growing can also result in clean paddocks for future crops.

Disease

Diseases do not become a problem in many new crops until the crop is well established. This was the case with poppy where many volunteer plants and alternative hosts harboured diseases which only had commercially important effects on the crop after 15 years.

Glaxo has developed and encouraged a conscious integrated pest control programme for poppy diseases. This includes:

- Crop rotation
- Minimising volunteers
- Fungicide dressing of seed
- Control of plant density
- Foliar fungicide application - still under development as suitable chemicals have only recently become available.
- Tolerance breeding - resistant strains were successfully released for the first time in 1984.

4. Summary of agronomic and commercial considerations derived from the poppy industry which are relevant to launching new medicinal crop ventures

No new crop venture will succeed without successful attention to each of the following:

(i) **Market Research** is paramount. Secure market outlets must be identified for many years ahead.

(ii) **Growing areas** must be carefully selected for suitability of climate, soils and location - this can take several years to define limiting factors using more than one standard cultivar to determine G x **E;** thus collection and evaluation of breeding stocks must occur.

(iii) Determine commercial feasibility:

- method of land preparation, planting and resources needed
- nutrient requirement
- weed control
- disease control measures
- optimal harvest state
- harvesting methods
- crop life and production patterns.

(iv) Canvass growers

Need to convince growers through competent field staff, of:

- attractive monetary returns competitive with other crops
- **reliability** of crop
- no adverse effects of crop.

Prevent growers making unnecessary mistakes.

(v) Have a **factory** capable of coping with the product volume and cycle of

production, and integrated with other crops.

(vi) **Fine tuning and continued R & D**

To remain competitive on world markets improvement programmes must continue, including: breeding; weed control; nutrition; irrigation; disease control; and an aspect often overlooked, viz by-product developments, e.g. seed, other chemicals.

(vii) Widen existing product base.

(viii) Strive for excellence.