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New Zealand's Innovation Agency

# Hemp Fibre

## Capability Roadmap

**Accessing the right capability to succeed in hemp as a fibre**

This roadmap will help you navigate this rapidly evolving industry – identifying the capability required for any business, whether you are focused or vertically integrated.

Providing information and guidance all the way from seed to market.

**Enter**

**Acknowledgements**

If you have any feedback or questions about this document, or have contributions to suggest please email us at roadmaps@callaghaninnovation.govt.nz

Version 2.0

**Develop your Strategy. Right from the start.**

Developing a successful business strategy, R&D, IP, regulatory and market access strategy should be the start point. They are core to establishing a hemp business and should be continually revisited as you grow.

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**We would like to acknowledge the following who were consulted in developing this roadmap.**

- Abacus Bio
- AgResearch
- Analytica Laboratories
- CP Wool
- ESR
- Fomana Capital
- HealthiNZ
- HempFarm
- HempConnect
- Hills Laboratories
- Ligar
- Massey University
- Midlands Seed
- Ministry of Business, Innovation & Employment
- Ministry of Health
- Ministry for Primary Industries
- NZ Yarn
- NZ Product Accelerator
- NZ Trade & Enterprise
- NZ Hemp Industries Association
- Otago University
- Plant & Food Research
- Scion
- University of Auckland
- Waikato University
- Woolyarns
- University of Auckland

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# R&D/IP STRATEGY

This capability refers to a range of activities to identify, create and manage intellectual property (IP) through developing and implementing your IP STRATEGY to gain a competitive advantage in the market place, enabling you to grow your business.

Your IP strategy should answer questions around what to do about IP, including determining what IP you have, how to protect and how to leverage it. It does not have to be expensive and should identify cost effective solutions.

It's particularly relevant if you are investing in new product development, commercializing a new product or innovation, exporting, accessing capital or if selling your business. However, it is also important when dealing with confidential information, when hiring staff, or when outsourcing or licensing.

It is important that you have processes for identifying the IP you create and a strategy for protecting and capitalising on it. It keeps your commercial goals to the fore and provides a framework for when you are deciding on what IP rights to secure and where to spend your money.

## WHAT IS NEEDED

- **DEVELOP IP STRATEGY**
- **LEVERAGE IP**
- **MANAGE AND PROTECT IP**

# DEVELOP IP STRATEGY

Bring integration IP thinking into your overall business strategy to create long term value.

Identify sources of IP first, which can occur at a number of points along the value chain:

- Unique genetics/breeds/cultivars
- Cultivation methods (i.e. organic)
- Processing technologies
- Materials development
- Branding, trademarks, copyrights

Specify confidential information with economic value. Trade secrets include confidential processes, customer information, business strategies, and secret recipes.

Understand your IP environment, particularly for patents and if exporting including territory, timing and scope.

Evaluate your company's freedom to operate (FTO) in the initial phase of your product development and systematically prior to launching a new product.

## ASK YOURSELF

- Do I have a business strategy in place?
- What impact does this have on my IP strategy?
- Have I identified the different sources of IP?
- Have I conducted an FTO analysis?

## ACCESS CAPABILITY

**IP SERVICE PROVIDERS**

**CALLAGHAN INNOVATION**
**INNOVATION IP PROGRAMME**

# LEVERAGE IP

Evaluate and implement best way to protect your identified IP.

Registration gives you certain exclusive rights over your brand or innovation, completed through a national IP office like the Intellectual Property Office of New Zealand (IPONZ). Includes:

- Registered trademarks®
- Patents
- Plant variety rights (PVRs): exclusive right to produce for sale and to sell propagating material of the variety.

Unregistered IP still offers legal protection and can also protect secret information. It includes:

- Unregistered trademarks™
- Trade secrets (i.e. recipes and customer databases)
- Confidential information: Secrecy agreements and Copyright©

Leverage your protected IP through enforcing IP rights or through licensing in/out. It's also important you consider your options at an early stage to minimize the risk of you infringing on another company's rights.

## ASK YOURSELF

- Do I recognise when important IP is being created?
- How do I protect my IP?
- Can our business capture IP?

## ACCESS CAPABILITY

- BUSINESS.GOVT.NZ
- INTELLECTUAL PROPERTY OFFICE OF NZ
- IP SERVICE PROVIDERS
- CALLAGHAN INNOVATION
  INNOVATION IP PROGRAMME

# MANAGE AND PROTECT IP

Put systems in place to manage your IP

**Tools and support:**

- Develop an IP checklist or asset register
- IP management systems: tracking patent due dates, workflows, manage legal requirements etc.

**Manage confidential information:**

- Add confidentiality clauses when hiring staff or contractors, especially given potential for IP loss through staff
- Insert legal clauses in documents including nondisclosure agreements (NDAs) and confidentiality agreements when out-sourcing work or licensing or distributing your products/services.

IP should be reviewed routinely as one of your managed risks.

## ASK YOURSELF

- What systems do we have in place to track our IP?
- How well are we managing IP issues when drafting and negotiating agreements?
- Are we actively managing the risk of IP loss?

## ACCESS CAPABILITY

- BUSINESS.GOVT.NZ
- IP CHECKLIST
- IP SERVICE PROVIDERS
- CALLAGHAN INNOVATION
  INNOVATION IP PROGRAMME

# REGULATORY & MARKET ACCESS STRATEGY

This is a REGULATORY and MARKET ACCESS capability which encompasses activities across the entire value chain for hemp products. Key activity is focused on meeting licensing requirements, required in order to grow, trade in, or process industrial hemp as an agricultural crop.

While the emphasis here is on the regulation of activities relating to products developed from the hemp stalk, there are additional requirements for dual use crops where the hemp seed is also to be used as a food, beverage or body care product.

Beyond industrial hemp licensing there are additional considerations depending on finished product, such as certification for construction materials to ensure compliance with the Building Code in NZ (BRANZ). These may be required in order to access specific export markets.

This capability extends to any other activities that improve market access for hemp products either in NZ or overseas.

## WHAT IS NEEDED

- LOCAL MARKET
- MARKET ACCESS

# LOCAL MARKET

You need to be licenced to grow, trade in, or process industrial hemp with applicants meeting a responsible persons test. The exception is for possession of hemp stems, with no leaves, which does not require a license as they are considered "hemp products".

You should have a secure site. Ideally more than 5 km from a residential development, or considered safe.

You can only grow an approved cultivar with less than 0.35% THC. This requires laboratory testing confirmation.

You will need to keep records of all hemp transactions on a register which are readily accessible, retrievable, and secure from tampering. This includes seed, cultivation and harvest registers, also included as part of annual reporting. There are potential software available to help hemp seed traceability.

## ASK YOURSELF

- Have I got a licensed activity?
- What are my security arrangements?
- Have I established registers for my activities?

## ACCESS CAPABILITY

**MINISTRY FOR PRIMARY INDUSTRIES**

**MINISTRY OF HEALTH**
INDUSTRIAL HEMP LICENSING

**CONSULTANTS FOR LICENSING APPLICATIONS**

# MARKET ACCESS

You will need to identify what is required for your hemp product to be exported to another market. It's important to get advice on the rules and regulations in international markets.

You will need to get clearance for anything you're exporting from New Zealand.

You need to identify the market arrangement and whether there is a free trade agreement in place. Also understand any tariffs that may be applicable depending on the market you are looking to export to.

## ASK YOURSELF

- Am I aware of export requirements?

## ACCESS CAPABILITY

- NZ TRADE & ENTERPRISE
- NZ CUSTOMS SERVICE
- NZ FOREIGN AFFAIRS & TRADE

# BUSINESS STRATEGY

Your BUSINESS STRATEGY specifies your core business and sources of competitive advantage in order to create long term value.

You will need to decide on the best strategy to build your strategic advantage. This could be either:

- **Market or competition-based:** Outwards focused based on current and proposed fit in market
- **Business-centred:** Inwards focussed leveraging your assets, capabilities
- **Innovation-based:** Creating your own space by switching strategic focus inwards, outwards, or using a mix of the two.

The majority of industrial hemp (iHemp) companies in New Zealand will pursue a differentiation strategy through value-added activities. Given this, your strategy will need to focus on those activities where you potentially have a competitive advantage, e.g. developing IP around brands, unique technologies and building share of distribution channels.

And once you've developed your business strategy, keep it up to date and review in the face of new opportunities.

## WHAT IS NEEDED

- MARKET VALIDATION
- BUSINESS STRATEGY
- PEOPLE
- PHYSICAL RESOURCES
- EARLY INVESTMENT STRATEGY
- FINANCIAL AND INVESTMENT STRATEGY

# MARKET VALIDATION

You will need to develop an approach to screen, prioritise, and qualify new products or markets.

Conduct a market opportunity assessment: Use available secondary market information to develop in-depth understanding of potential markets, quantify the market opportunity and understand the competitive landscape and category trends. Accelerate learning by connecting with industry associations or government agencies who may have direct market experience.

Talk to businesses and consumers in target market to understand needs and determine the overall opportunity. This should include defining and sizing the market problem, your target audience and developing and testing your unique value proposition based on desired product features and claims.

## ASK YOURSELF

- Am I qualifying new product opportunities?
- Do I understand customers unmet needs?
- Am I validating new product opportunities with customers or consumers?

## ACCESS CAPABILITY

- **ICEHOUSE**
  **MARKET VALIDATION PROGRAMME**
- **NZ HEMP INDUSTRIES ASSOCIATION**
- **NZ TRADE & ENTERPRISE**

# BUSINESS STRATEGY

Start by articulating your vision and mission to help set your direction: Describe what success looks like and what you want to achieve in a way you can break down and measure it.

Understand your situation through a proper assessment that includes environmental, competitive analysis and a SWOT. This will also inform your Go to Market approach.

Make sure to set a single business goal (or strategic objective). From this, you should also detail objectives to help you measure progress, set targets and plan projects that help you reach them.

Reflect your business strategy in your implementation plans (marketing, operations, resourcing).

Put measurements in place. Make sure that these link back to your overall strategy, allowing you track your progress.

## ASK YOURSELF

- Do I have a vision and mission?
- Have I conducted a market assessment?
- What is my business goal?
- Do I have implementation plans?
- Have I got the right systems in place to track progress?

## ACCESS CAPABILITY

- ECONOMIC DEVELOPMENT AGENCY
- BUSINESS.GOVT.NZ
- NZ TRADE & ENTERPRISE
- BANKS

# PEOPLE

You will need to specify the people resources you will need to carry out the planned activity.

Determine the people skill sets that you need and whether or not to buy or acquire them. Consider the potential to bring in knowledge agents from related industries or more developed markets.

Ensure you have the right management capability in place including leadership, personnel training, health and safety, sales and business development. This includes planning for leadership changes, i.e. managing the transition from founder to CEO.

Ensure you have governance processes in place.

Continually review your people resource and need to change as you grow and develop your business.

## ASK YOURSELF

- Have I got a people resource plan in place?
- Do I have the right team and experience in place?
- What is the capability of my management team? Now and moving forward?
- Am I reviewing my people resource?

## ACCESS CAPABILITY

- INSTITUTE OF DIRECTORS
- BUSINESS.GOVT.NZ
- HUMAN RESOURCES INSTITUTE OF NZ HRNZ
- APPOINT BETTER BOARDS

# PHYSICAL RESOURCES

You will need to specify the physical resources you will need to carry out the planned activity. This includes raw materials, buildings and facilities, machinery, energy, and supplies.

Determine the capabilities you are developing and the physical resources required. This will also inform whether you invest in specific resources, or outsource. This also may be the opportunity to look at strategic partnership arrangements.

Review different technology platforms as a means to innovate and build capability including those that can be transferred from related industries (I.e. hops, forestry). Many of these will be identified through research and development programmes, likely to require specialised equipment and additional investment.

Evaluate the role of digital technologies including robotics and automation; traceability and communication to further develop capability.

## ASK YOURSELF

- Have I got a physical resource plan in place?
- Do I need to invest or outsource?
- Are there specialised equipment required for technology platform?
- What digital technologies will help deliver my strategy?

## ACCESS CAPABILITY

- TECH INCUBATORS
- BUSINESS.GOVT.NZ
- CALLAGHAN INNOVATION GETTING STARTED

# EARLY INVESTMENT STRATEGY

Your early investment phase will in most cases focus on important R&D and IP activities to support Business Strategy and mitigate risk for investors in subsequent capital raises

Understand your R&D requirements to generate a proof of concept supporting a differentiated product and how you are going to fund initial activity. This could be from shareholders or from Grants etc.

You need to articulate an R&D Programme and specify the activities you are going to undertake as grant funding can be an enabler for your IP and regulatory strategy without diluting equity at an early stage.

## ASK YOURSELF

- How can you get capital outside of equity funding?
- How do I get access to early stage funding?
- Do I have a path to market?
- Am I able to co-fund?
- What is my R&D Programme and what can I afford?
- Have I identified key risks for early stage investors?

## ACCESS CAPABILITY

- WASTE MINIMISATION FUND
- BIORESOURCE PROCESSING ALLIANCE
- CALLAGHAN INNOVATION GETTING STARTED
- AGMARDT
- SUSTAINABLE FOOD AND FIBRE FUTURES

# FINANCIAL AND INVESTMENT STRATEGY

You will need to specify the financing needed to carry out your planned activity.

Understand the commercialisation process and the expected timeframe. Know your cash burn rate and whether you are likely to require external sources of capital or if you can use bootstrapping to get to first sale.

Determine your capital structure and financing required to deliver your business strategy. This will depend on the timing of investments and your planned approach to scaling the business.

Understand different options for capital, including how to access or raise capital if required.

If relevant consider strategic alliance such as joint venture or equity alliance. This can provide smart capital. i.e. financial resource with intellectual capital.

## ASK YOURSELF

- What is my ideal capital structure?
- What is my timeframe to commercialisation?
- What is my cash burn rate?
- What investments are required to effectively scale?
- Do I understand how to access or raise capital?

## ACCESS CAPABILITY

- CAPITAL EDUCATION PROGRAMME
- NZ TRADE & ENTERPRISE
- NZ GROWTH CAPITAL PARTNERS

# PLANT BREEDING

The *Cannabis sativa* plant has a history spanning thousands of years across the globe with genetic diversity. Industrial hemp refers to those varieties that have a tetrahydrocannabinol (THC) content generally below 0.35 percent.

This is a licensed RESEARCH and BREEDING capability which includes procurement and breeding of specific cultivars and varieties for the purposes of targeting fibre quality.

Cultivars need to be approved by gazettal before they are able to be used for growing, manufacturing and selling hemp. Approved industrial hemp cultivars in NZ are: *A1 Monopurp, Anka, Aotearoa 1, CFX-1, CFX-2, CRS-1, Fasamo, Fedora 17, Ferimon 12, Finola, Futura 75, Katani, Kompolti, Sirius, USO 31.*

Other important considerations are the role of breeding programmes and record keeping.

## WHAT IS NEEDED

- **STARTING MATERIAL**
- **BREEDING PROGRAMMES**
- **LICENSING**

# STARTING MATERIAL

You will need to select cultivar from seedstock that has been approved for industrial hemp in NZ.

These can be obtained from a licensed seedstock provider.

You can also import whole seeds however you will need an import/export controlled drug permit and will need to comply with all phytosanitary requirements. These include:

- Source from a pest-free area and/or
- Treat the seeds using a hot water dip prior to shipment
- Ensuring seed is free from contamination

You should refer to the relevant MPI import health standard for more information, i.e. importing seed for sowing or importing seed for processing IHS. There are differences in access to seedstock across countries and there are international genetic libraries that can be accessed.

## ASK YOURSELF

- Am I using an approved cultivar?
- Am I wanting to import seeds?

## ACCESS CAPABILITY

- PLANT & FOOD RESEARCH
- MINISTRY FOR PRIMARY INDUSTRIES
- NZ HEMP INDUSTRIES ASSOCIATION
- MINISTRY OF HEALTH
  INDUSTRIAL HEMP LICENSING

# BREEDING PROGRAMMES

Optimise performance for your growing location especially given the range of conditions across the country. Best economic returns are likely to be generated from acclimatised regional specific cultivars.

Well-designed breeding programmes start with a good understanding of positive traits that you're interested in developing to bring in new plant varieties (i.e. fibre quality). This should emphasise genetic stability and reproducibility.

Breeding tools include crossing, quantitative selection for genetic gain and genomic selection.

Data management and accurate record-keeping is important to understand relationship amongst plants (phenotypes and pedigrees), track the usable crosses you've made. Genetic software can help you manage this including quality of records, crossing plans, measurement of key traits.

## ASK YOURSELF

- Is my breeding programme aligned with my business strategy?
- What breeding tools am I considering?
- What data management systems do I have?

## ACCESS CAPABILITY

- PLANT & FOOD RESEARCH
- MINISTRY FOR PRIMARY INDUSTRIES
- ABACUS BIO

# LICENSING

You will require a license for research and breeding.

This will assess the suitability of specified cultivars and varieties of hemp.

Every licence holder who is authorised to possess hemp seeds and cultivate must keep a seed register, cultivation register and a harvest register. Copy of registers must be provided to the Authority on request.

**Seed register:** This lists the amount by weight of the seeds supplied or procured; the cultivar or variety; the name of the person to whom those seeds were supplied or from whom they were procured.

There are specific requirements for the cultivation and harvest registers, which are detailed in the industrial hemp regulations

## ASK YOURSELF

- Do I have the right license for breeding?
- Do I have record keeping in place?

## ACCESS CAPABILITY

**MINISTRY OF HEALTH**
**INDUSTRIAL HEMP LICENSING**

# CULTIVATION

This is a licensed CULTIVATION capability encompassing the entire growth cycle for the low THC *Cannabis sativa* plant from start to harvest.

The purpose of cultivation activity is to harvest the stalk given its fibre properties. Crops grown for fibre are managed differently from seed crops and are grown from slightly different varieties of industrial hemp. There is also the option for dual use cropping where both the hemp seed and stalk are harvested. Also see **Hemp Seed Roadmap.**

Activities considered to be part of cultivation are:

- seed for the purposes of growing
- growing
- harvesting and retting

The quality of the fibre can be determined by agronomic practice, genotype, harvesting and retting method.

In addition, there are important considerations in relation to security (physical measures, operational procedures).

## WHAT IS NEEDED

- SITE SELECTION AND PREPARATION
- SOURCE MATERIAL
- GROWING
- HARVESTING AND RETTING
- LICENSING

# SITE SELECTION AND PREPARATION

Assess how site was previously utilised and if any remediation required prior to cultivating due to residues or toxicities. Hemp requires finely tilled soils rich in organic matter.

Look at the upfront costs given electricity may be required for irrigation, especially in drier regions, together with security costs.

Take a farm systems approach: Hemp can be an ideal rotation crop, helping break up and condition soil. Can be mixed in crop plantations. e.g. alongside grapes and pine plantations.

Your site should also ensure that all hemp can be stored in a building or container that is securely locked or guarded.

## ASK YOURSELF

- Have I assessed previous site usage?
- Have I conducted soil testing?
- Have I considered up-front costs?
- Is my site secure?

## ACCESS CAPABILITY

- **AGRESEARCH**
- **CONSULTANTS FOR LICENSING APPLICATIONS**
- **TESTING LABORATORIES**

# SOURCE MATERIAL

You need to decide your cultivar type, either specialised for fibre or for dual cropping. This may depend on fibre use with dual cropping varieties produce less lower quality fibre.

Select cultivar from those approved for industrial hemp: *A1 Monopurp, Anka, Aotearoa 1, CFX-1, CFX-2, CRS-1, Fasamo, Fedora 17, Ferimon 12, Finola, Futura 75, Katani, Kompolti, Sirius, USO 31.*

Optimise performance for your growing location given no acclimatised seedstock specifically designed for New Zealand soil types.

You may want to conduct trials of approved cultivars with different properties. Taking factorial design approach to look at all variables; soil, season, field position.

Best economic returns likely to be generated from acclimatised regional specific cultivars.

## ASK YOURSELF

- Am I using an approved cultivar?
- Have I optimised performance for growing location?

## ACCESS CAPABILITY

- PLANT & FOOD RESEARCH
- MINISTRY OF HEALTH
  INDUSTRIAL HEMP LICENSING
- MINISTRY FOR PRIMARY INDUSTRIES
- NZ HEMP INDUSTRIES ASSOCIATION

# GROWING

You need to plant seeds close together to encourage plants to grow straight and fast and maximise length of fibre obtained from stems.

Establish high cultivation standards growing crops to ensure quality is managed. You should also consider yield optimisation, plant protection, and sustainable production issues.

Manage cultivation risks including contamination with pesticides, heavy metals, and hazardous moulds, bacteria and fungi.

You will require a THC test if it is stipulated on your licence. This requires samples of hemp plants from each of the seed stocks and different environmental conditions should be taken about 2–3 weeks before plants are due to be harvested for laboratory testing to ensure THC content < 0.35%.

## ASK YOURSELF

- What production planning processes do I have in place?
- Have I planned for THC testing?

## ACCESS CAPABILITY

- PLANT & FOOD RESEARCH
- ESR
- NZ HEMP INDUSTRIES ASSOCIATION
- HILLS LABORATORIES
- TUPU.NZ

# HARVESTING AND RETTING

Harvest as soon as pollen is shed for high quality fibre, usually 70–90 days after sowing, although this will vary by cultivar and location. Dual crops are harvested later.

You will need specialised equipment as tough fibre can damage machinery. Requirements depend on whether you are harvesting dual-purpose crop or targeting fibre. Opportunity to innovate in this area.

Retting your harvested hemp stalks facilitates the separation of bast fibres from one another and from woody core (hurd). Leaving plants in field to ret is most common approach, with machine turning several times to ret evenly. They then may need to be dried and stored until they are ready to be delivered, at this point they could be whiter and dried. There are alternative methods including chemical which can reduce retting duration.

Depending on end use you might want to put them in round bales, or chop them in 600-800 mm lengths and put them in square bales. Your customer or local processor will advise you as to how they want to receive the retted stems.

You will also need to record destruction of any hemp seeds and plant material, with acceptable methods including composting, mulching or burning. Biomass not processed can be directed to other value adding activities to minimise waste.

## ASK YOURSELF

- Do I have the right harvester?
- What is my plan for destruction?

## ACCESS CAPABILITY

BIORESOURCE PROCESSING ALLIANCE

# LICENSING

You require an Industrial hemp general licence with 'cultivation' listed as an activity.

If you have a dual use crop and intend to use hemp seed as food, you also need to be registered under the Food Act with the Ministry of Primary Industries.

Growers can only sell whole hemp seeds to someone who holds an Industrial hemp general licence with 'procurement' or 'processing into specified hemp products' listed as an activity. Whole hemp seed is a class C drug. Dehulled hemp seeds are a hemp product and so do not require a license.

You must keep a seed register as licence holder who is authorised to possess hemp seeds. Every licence holder who is authorised to cultivate hemp must also keep a cultivation register and a harvest register. Copy of these must be provided to the Authority on request.

You should be aware that hemp stems (with no leaf) are hemp products and you do not require a licence to possess or work with them

## ASK YOURSELF

- Do I have the right license?
- Do I have the required registers?

## ACCESS CAPABILITY

**MINISTRY FOR PRIMARY INDUSTRIES**

**MINISTRY OF HEALTH**
**INDUSTRIAL HEMP LICENSING**

# PROCESSING CAPABILITY

The PROCESSING capability refers to a number of activities that separate each part of the hemp stalk, which is then further processed for different applications. The most important consideration in processing steps are to obtain the desired level of refinement without causing excessive damage.

- **Fibres:** Hemp stalk exterior contains different length fibres that are some of the strongest natural fibres known on earth. Includes long length bast fibres and short length tow fibres which are separated through processing.
- **Hurd:** The inner woody pith of the hemp stalk, sometime called Shiv.
- Stalk itself can be processed further where the desired properties come from the fibre and hurd.

Increased availability of processing facilities in New Zealand is expected to stimulate growth in fibre market development.

Following processing there may be additional value adding activity to minimise waste.

## WHAT IS NEEDED

- **PRIMARY PROCESSING – DECORTICATION**
- **FIBRE PROCESSING**
- **HURD/STALK PROCESSING**

# PRIMARY PROCESSING – DECORTICATION

First confirm processors with a decorticator can take your crop and you are within service range as fibre transport is expensive given its bulk. While some decorticators can be transportable to the crop these may not be appropriate.

You need to decorticate to split the dried and retted hemp stalks into fibre and hurd. Stems go in the decorticator and are crushed, broken etc to separate the fibre and hurd.  Dust is a health and safety issue and needs to be managed.

Use a "scutching" process to separate more short fibre and the remaining hurd material from the long fibre, either manually or using rotary blades.

Your fibres should be separated by length for different applications.

## ASK YOURSELF

- Do I have access to processing facility?

## ACCESS CAPABILITY

- NZ HEMP INDUSTRIES ASSOCIATION
- HEMPFARM

# FIBRE PROCESSING

You need to remove all binding and filling materials around fibres for textile use. Techniques such as steam explosion, chemical or biological degradation further decorticate pretreated fibres and improve fineness.

Use a carding system or combing process known as “hackling” to draw and parallelize separated long fibres into a sliver, from the random structure assumed during earlier processing. After this stage, fibres can be cut to length, compacted and baled for storage or transportation.

If you need to generate technical fibres processing steps including fibre refining and cleaning, sieve to remove very short fibres and dust removal.

Short length “tow” fibres will also be extracted during the hackling process. These can be compressed and baled for further use.

## ASK YOURSELF

- Do I have access to facilities for processing fibre?

## ACCESS CAPABILITY

- NZ HEMP INDUSTRIES ASSOCIATION
- HEMPFARM

# HURD/STALK PROCESSING

You may need to grade hurd pieces for different construction applications following decortication.

Consider optimal use of the "whole" plant, bio-composites and plastics.

Use a cellulolysis process to extract ethanol from hemp stalks. Includes pre-treatment, enzymatic (cellulase) treatment, separation, fermentation distillation and concentration.

You can also pulp stalks for a range of applications including paper making and as sustainable cellulose source for nanocarbons. This requires the breakdown of fibre bundles by chemical and physical methods however some (like the Kraft method) have chemical waste products. There are new technologies being investigated to eliminate this employing "green chemistry".

## ASK YOURSELF

- Am I able to process the hurd/stalk?
- What is the intended use of the hurd/stalk?
- Have I considered environmental impact of processing?

## ACCESS CAPABILITY

- NZ HEMP INDUSTRIES ASSOCIATION
- HEMPFARM
- SCION

# MATERIALS DEVELOPMENT

This is MATERIALS DEVELELOPMENT capability focussed on activities to improve the performance of materials containing hemp processed from the hemp stalk and research their use across a wide range of applications.

The materials include:

- **Fibre-based:** Blending yarns for textiles, rope, netting, canvas or use in bio-composites
- **Hurd-based:** Construction materials including fireboard, insulation and concrete
- **Stalk-based:** sustainable cellulose source, nanocarbons, biofuels, ethanol, paper products and cardboard

Hemp product development is focused on various innovative applications such as ecological, biodegradable, and renewable resources with unique properties. This is often where hemp is a direct replacement for synthetic petroleum-based alternatives which in some cases can achieve higher material performance based on desired qualities.

It is important to consider the domestic path to market for any researched material applications as part of feasibility assessment. The wide range of potential applications can also encourage

## WHAT IS NEEDED

- **BLENDING YARNS**
- **BIO-COMPOSITES**
- **CONSTRUCTION MATERIALS**

# BLENDING YARNS

Use separated and processed long bast fibres.

Your blend of hemp with other fibres to produce yarns should incorporate the desirable qualities of both textiles. Hemp can be blended with a range of fibres including wool, cotton, linen and silk, possum and NZ flax Harakeke.

Your yarn spinning technique will be dependent on the length, quality and preparation of the fibres as well as equipment availability. This will determine end result and could be either:

- **Worsted** process aligning fibres parallel to each other, with yarn producing fabric that can be used in wide range of textiles.
- **Woolen** process is for shorter fibres with no attempt to align fibres along the yarn. It is quicker producing thicker, hairier yarn

Consider dying processes, if required, which can be reactive or more environmental based systems.

## ASK YOURSELF

- What are the desirable qualities you require?
- What spinning technique are you using?

## ACCESS CAPABILITY

- NZ YARN
- WOOLYARNS
- DESIGN SPUN
- NZ PRODUCT ACCELERATOR

# BIO-COMPOSITES

Use fibres processed, cleaned and cut to a consistent length.

You should first identify a research partner to support your materials development. Hemp fibres have range of applications, mainly as reinforcement in composite materials. With a suitable matrix, can provide stiffness and specific tensile strength comparable to commercial fiberglass, with reduced weight (up to 40%).

Potential applications include:

- Thermoset
- Thermoplastic
- 3D printer filament

Your composite properties will be influenced by fibre selection and processing, matrix selection, fibre dispersion, orientation and porosity. Further research is also required on moisture resistance and fire retardance of hemp-based composites.

While application may initially focus in specialised areas (which in New Zealand could include high-tech yachting or even aerospace) these should provide a path for development of methods and specifications for more widespread use over time.

## ASK YOURSELF

- Do you have suitable fibre?
- Have you researched properties?

## ACCESS CAPABILITY

**UNIVERSITY OF AUCKLAND**
**CENTRE OF ADVANCED COMPOSITE MATERIALS**

**SCION**

**NZ PRODUCT ACCELERATOR**

# CONSTRUCTION MATERIALS

You will predominantly be using the separated hurd for construction materials, although some applications will also incorporate fibres. These include:

- Interior and exterior walls made from Hempcrete contain hurds, water and suitably certified binder.
- Insulation replacing glass fibre batts. Hurd can be loosely blown into building cavities.
- MDF boards and plywood substitutes
- Wood replacement products

Your R&D efforts are likely to focus on environmental sustainability in materials use and to develop local supply chains for the construction market.

You will need to research performance of construction material in range of New Zealand conditions, including thermal and humidity regulation.

Assess materials for building code compliance and fire retardancy testing with BRANZ.

Consider innovation in materials development. Examples include using hemp and mycelium or recycled plastics, development of suitable domestically certified binders.

## ASK YOURSELF

- Have I identified material use in construction?
- Have I completed testing for use?

## ACCESS CAPABILITY

- BRANZ
- CALLAGHAN INNOVATION
- NZ HEMP INDUSTRIES ASSOCIATION
- NZ PRODUCT ACCELERATOR

# MANUFACTURING

This capability relates to key activities required to MANUFACTURE a finished product from a hemp containing material. This could be material containing the fibre, the hurd or both.

- **Fibre-based products:** textiles (clothing, furniture coverings and flooring), rope, netting, canvas and bio-composites
- **Hurd-based products:** construction materials including fireboard, insulation and concrete
- **Stalk-based products:** including biofuels, ethanol, paper products, cardboard, nanocarbons

It is important to consider the domestic path to market for any application including whether domestic manufacturing capability exists for desired end product. For example, there is limited textile manufacturing capability in NZ which may necessitate to partner offshore for some manufacturing activities.

It is also important to consider the derived demand for hemp through increasing industrial and consumer use of a wide range of manufactured hemp containing products. A good example here is with the increased use and experience as a construction material for domestic housing projects providing a catalyst for projects of increasing scale. Hemp products also have a role to play in reducing CO2 in construction from sustainable products with the building industry having a target to be carbon neutral by 2030.

## WHAT IS NEEDED

- **TEXTILE MANUFACTURING**
- **BIO-COMPOSITES**
- **CONSTRUCTION MATERIALS**

# TEXTILE MANUFACTURING

You should identify a contract manufacturer for your textile product, ideally one with experience working with natural fibres and operating at ISO standard with suitable environment standards and processes.

The properties of hemp make yarns suitable for a range of commercial and residential applications. It compliments our other primary industries, especially wool, this is especially if abrasion resistance and durability qualities desired, such as for upholstery or carpets.

Work with designer to translate product concept into woven samples for testing and customer research first.

For manufacture, consider fibre and yarn properties, weaving method, dying, finishing and product testing.

In addition, for clothing and textile manufacture consider product safety requirements for formaldehyde.

## ASK YOURSELF

- Have I identified a manufacturer?
- Do I have a product concept?

## ACCESS CAPABILITY

- CAVALIER BREMWORTH
- FELTEX
- INTERWEAVE NZ
- MBIE
- NZ HEMP INDUSTRIES ASSOCIATION

# BIO-COMPOSITES

You need to work with manufacturer to identify suitable process and hemp bio-composite material, based on the desired qualities of finished product.

Manufacturing options include:

- **3D printing**
- **Extrusion Moulding** – hemp containing plastic is forced through a die in one continuously formed shape, as in film, sheet or tubing
- **Injection Moulding** – forcing plastic, in a molten state and under pressure, into closed mould.
- **Resin Transfer Moulding** – utilising hemp preform reinforcement. Cured in mould

Wide range of potential applications including as replacements for single use packaging, disposable items including plates, cutlery bags and bottles. As well potential for agriculture and marine application.

## ASK YOURSELF

- Have I identified a manufacturer?
- What is best manufacturing process?

## ACCESS CAPABILITY

- SCION
- COMPOSITES ASSOCIATION OF NEW ZEALAND

# CONSTRUCTION MATERIALS

Understand industrial demand for different hemp construction materials including previous experience, ease of application, compliance, cost and scalability for larger projects.

Evaluate pre-cast hemp blocks or prefabricated panels for non-structural use alongside Hempcrete. Manufacturing process typically involves mixing, moulding curing and palletisation with sufficient drying time.

Thermal and hydroscopic attributes of products will need to be assessed and you will need to work with BRANZ for building code compliance and fire retardancy testing.

Evaluate changing potential for range of other manufactured construction materials including plywood products (without formaldehyde) or insulation products.

## ASK YOURSELF

- What is the demand for different materials?
- What are the properties of the manufactured product?

## ACCESS CAPABILITY

- NZ HEMP INDUSTRIES ASSOCIATION
- HEMPFARM

# BRANDING, SALES AND MARKETING

The BRANDING, SALES and MARKETING capability relates to activities in order to brand, promote and sell your hemp product. The main distinction will be whether this is:

- **Business to consumer (B2C):** products sold to consumers for their own use such as carpet or clothing
- **Business to business (B2B):** products sold to other organisations suitable for use or resale such as biofuel and bio-composite materials

There are also a range of hemp products which have both an industrial and consumer use.

Given the high global production of hemp it's likely that margins will be concentrated with those who add value through developing unique products and brands, create proprietary technology, as well as manage key distribution channels.

Product needs to uniquely deliver claimed benefits. Decisions on distribution, pricing and level of marketing and promotional activity will ultimately depend on your target market and the changing competitive and category landscape.

## WHAT IS NEEDED

- **PRODUCT AND CATEGORY STRATEGY**
- **PROMOTIONAL STRATEGY**

# PRODUCT AND BRAND STRATEGY

Build experience and claim support for your product or category based on desired use. This will include sufficient research of materials performance to include in data sheets.

Plan how you will innovate and grow over time. This could be from a single product to product range, or multiple products across a range of categories, all meeting distinct business or consumer needs.

For business to business activities consider your selection of channel partners and ensure they are aligned with your overall brand strategy, especially around sustainability and the environment.

## ASK YOURSELF

- What categories and formats am I developing in?
- Do I have a brand strategy?

## ACCESS CAPABILITY

- MARKETING ASSOCIATION
- NZ TRADE & ENTERPRISE

# PROMOTIONAL STRATEGY

Your promotional material and information should emphasise the unique value proposition and claims for the product and category.

This may extend to endorsements or video demonstration case study experience, such as with hemp materials used in home build projects.

Understand your compelling brand story – especially founder stories as means to reinforce. The category story should also consider promoting wider environment benefits of hemp as a material, including rural and farm sustainability.

## ASK YOURSELF

- How do I plan to promote my product?

## ACCESS CAPABILITY

- MARKETING ASSOCIATION
- NZ TRADE & ENTERPRISE

# DISTRIBUTION

The DISTRIBUTION capability relates to activities in order to distribute your hemp product and these could be through business or consumer channels. Your approach to distribution will also depend whether you are focused on the domestic market or intend to export:

- **Business to consumer:** carpet, clothing, bio-composite products
- **Business to business:** bio-composite products, construction materials

A clear distribution strategy includes channel selection and managing channel relationships to increase market share.

## WHAT IS NEEDED

- **LOCAL MARKET DISTRIBUTION**
- **INTERNATIONAL MARKET DISTRIBUTION**

# LOCAL MARKET DISTRIBUTION

Develop and implement your distribution strategies in market, being aware of important industrial or consumer channel trends.

For consumer channels consider specialist stores and online channel sales. Establish and maintain trade relationships with trade support activity to support product and category growth.

For consumer channels evaluate potential for online sales through own brand or corporate website. Alternatively distribute through established e-commerce platforms as an alternative entry point.

For business channels establish direct sales business model, often working with well-educated buyer or organisation representatives to develop and grow channel sales.

## ASK YOURSELF

- Do I have a distribution strategy?
- What channel relationships do I have?
- Have I evaluated online channel?
- Do I know who the buyer or organisational representative is?

# INTERNATIONAL MARKET DISTRIBUTION

You need to know MARKET ACCESS considerations Assess industrial or retail channel development in target markets, especially given widespread hemp product availability in other developed countries.

Understand what different business and consumer markets allow in terms of product, distribution, marketing and promotion.

Establish agreements with industrial buyers or distributors to import in target market. This could include a range of additional services to support your Go to Market activity.

Evaluate potential for distributing and managing business relationships through e-commerce platforms which may offer a low risk, low investment mode of market entry.

## ASK YOURSELF

- Do I have a distribution strategy?
- What channel relationships do I have?
- Have I evaluated online channel?

## ACCESS CAPABILITY

- NZ FOREIGN AFFAIRS & TRADE
- NZ TRADE & ENTERPRISE