How Formulation Types & Greenhouse Operations Factor Into Agricultural Chemical Products
At CJB Applied Technologies, the lab and the greenhouse play significant roles in the formulation of agricultural chemical products.

In the lab, you must decide which formula type is best suited for your agricultural application. The greenhouse is used to narrow down candidates, reduce risks, and reduce the costs of field trials.

In this eBook, we’ll explore different formulation types we can create in the lab for agricultural applications, as well as the benefits of having a greenhouse on site.

**How Do Formulation Types Fit Into Agricultural Applications?**

When it comes to formulation development in agriculture, you can’t take a one-size-fits-all approach.

You need to choose the formulation type that’s best suited for your application’s purpose.

Here are some of the different formulation types we develop at CJB Applied Technologies and how they work with agricultural applications.

**What Formulation Types Does CJB Applied Technologies Develop?**

Our team has used a variety of formulation types to create hundreds of products for our customers. Here are some of CJB Applied Technologies’ areas of expertise.

**Wettable Powders (WP)**

**Wettable powders** (WP) consist of an active ingredient and other constituents in a finely ground powder state that’s generally mixed with water to form a suspension in a spray tank.

**Water-Dispersible Granules (WDG)**

Water-dispersible granules (WDG) are WP-like formulations that have been compressed or formed into dust-free, granule-sized particles.
These are sometimes called dry flowables (DF) or extruded granules depending on the technologies that are used to form the granule.

Emulsifiable Concentrates (EC)
Emulsifiable concentrates (EC) typically consist of an active ingredient dissolved in a non-water solvent and other ingredients (such as an emulsifier).

Suspension Concentrates (SC)
Suspension concentrates (SC) contain tiny particles of the active ingredient that are milled to reduce the average particle size, and then suspended in water. Other ingredients are added for functionality and performance.

Suspo-Emulsions
Suspo-emulsions consist of at least two active ingredients. One active ingredient is a liquid in stable emulsion with the liquid diluent. The second active ingredient is in the form of tiny particles suspended in the emulsion.

Impregnated Granules
Impregnated granules consist of liquid active ingredients applied to inert, carrier granules and then dried.

Stabilized Emulsions (SE)
Stabilized emulsions are mixtures of droplets of one liquid in another liquid where the size and dispersion of droplets do not change over time.

Soluble Liquids
Soluble liquids are typically water-based products that contain a dissolved active ingredient.

Oil Dispersions
Oil dispersions consist of tiny solid particles of the active ingredient suspended in an oil—plus emulsifiers that help the product mix with water for spray application.

Soluble Powders & Granules
Soluble powders and granules consist of water-soluble active ingredient(s) in the form
of a dry powder or granule that wet quickly into water and dissolve.

Baits
Baits contain an active ingredient mixed with food or another attractant substance.

How Do I Know Which Formulation Type Fits an Agricultural Application?
You have to consider many factors when determining which formulation type is best suited for your agricultural application.

Depending on the factors and variables you’re dealing with, one type of formulation is going to be better than another to achieve your goal.

Here are some questions to consider when choosing a formulation type.

• What is your target crop? (e.g., are you treating soybeans, corn, cotton, tomatoes, potatoes, etc.)
• What is your target pest? (e.g., weeds, insects, fungus, bacteria, etc.)
• What is the typical application equipment in the geography and crop?
• What are your manufacturing availabilities? Are you only able to make a liquid product, or can you also make a dry product?
• What is your target cost? Will you be able to afford a more expensive formulation technology if it’s necessary for the application?
• What are the chemical requirements of your active ingredient? Does your active ingredient have to be emulsified in a petroleum-type environment, or can it be mixed with water?
• What other chemicals can be formulated with your active ingredient? Do you need formulation functionality such as spreading, sticking, and penetrating?
• Will the formulation be applied in a tank mix with other products? In water or fertilizer?
How Can CJB Applied Technologies Help Develop My Formulation?

The team at CJB Applied Technologies has decades of experience in developing many different formulation types for agricultural applications.

Our scientists have expert knowledge in formulation development. The team is equipped with the tools and technology to produce a variety of formulation types in a lab environment. Our experts are also able to use our pilot plant resources to scale up and reduce the risk inherent in lab to commercial-scale production.

With this wide range of capabilities, CJB Applied Technologies meets the needs of our customers by developing formulas for products that are ideal for the chemistry, crop, pest, and multiple variables impacting formulation performance.

How Do Formulation Types Fit Into Agricultural Applications?

Now that you’re more familiar with the different formulation types, it will be easier to select the ideal technology for your agricultural application.

By defining the targets, goals, and objectives of a pest application—and by knowing the benefit of each formulation type—you can work with a chemist to determine the best method for your project.

How Does a Greenhouse Aid Formulation Development?

As a CJB Applied Technologies customer, you can grow your competitive edge by using our integrated approach to product and formulation development.
Greenhouses play an important role during the formulation development process. That’s where scientists can test the characteristics, performance, and quality of multiple formulation candidates at one time.

Here is how we use our greenhouse in formulation development and the advantage of having this operation on site.

How Is a Greenhouse Used in Formulation Development?
A greenhouse is a controlled environment where the testing of formulation candidates takes place. You can adjust specific variables under supervised conditions to see if the candidates have the desired impact on various plant species and pests.

Different soils and growing conditions may be used during this performance testing. Pests such as fungi and bacteria can be brought in (inoculation) to measure the formulation candidates’ effect on them. You may also need to test for phytotoxicity to find out if the formulations are safe for a crop. Chemical concentrations can be altered to see if plant safety still exists at 3x and 4x typical use rates. Greenhouse testing allows you to change elements as necessary to match real-world situations and present new challenges. You can introduce variables and limit external factors. For example—in a field trial—wind, hail, rainfall, or lack of (or overabundance of) pest pressure can create confusion and take the focus off of what you’re trying to discover about candidate formulations. You can eliminate such issues in a greenhouse.

The role of the greenhouse is key when it comes to cost-effectiveness. When you’re developing a formula, you may start with a multitude of candidates. If you were to do field trials on each of them, costs would quickly add up. A greenhouse gives you the ability to test to narrow the candidate formulation choices.
down to two or three that will likely perform the best. The lesser number of formulation candidates can then be taken to field trials, at a much-reduced cost.

What Is the Benefit of Having a Greenhouse On-Site?
CJB Applied Technologies has a greenhouse at our new technology center. We can take a dozen formulation candidates straight from the lab into the greenhouse and start testing without delay. If we need to adjust the formulas, we can go back and forth from the greenhouse to the lab—tweaking and testing as needed—until we accomplish our goal and shrink the pool of candidates.

When a contract development and manufacturing organization (CDMO) doesn’t have a greenhouse, the organization must outsource this step of formulation development to a third party. The contractor has to fit the CDMO’s greenhouse testing into their schedule, which could cause delays. The CDMO will have to pass down the cost of using the other business’s greenhouse operations to the customer.

Having a greenhouse on site at CJB Applied Technologies makes us more efficient and effective in completing formulation development projects for our customers. We can test candidates in the greenhouse whenever we want instead of waiting to be worked into someone else’s schedule. There’s also less chance of miscommunication because we don’t have to depend on another organization.

Being able to take candidates directly from the lab to the greenhouse improves the chance of success for every formulation development project managed by CJB Applied Technologies. Based on the outcomes of greenhouse tests, we can make changes to a formulation to improve it and seamlessly transition into the next phase of formulation development.
How Do Greenhouse Operations Aid Formulation Development?
The greenhouse plays such an important role in the formulation development process that CJB Applied Technologies prioritized having this facility on site.

With our lab and greenhouse on the same property, we can test candidate formulations more effectively and efficiently to better serve our customers.

How Formulation Types & Greenhouse Operations Factor Into Agricultural Chemical Products
Now you know why it’s important to know how formulation types fit [agricultural applications](#) and how a greenhouse makes the development process more efficient.

CJB Applied Technologies can help you take your agricultural chemical product idea to market faster. We offer contract development services, scale-up/pilot plant production, and consulting/product recovery.

Speak to a scientist today, and let’s get started on your project!