

Scientific Research and Experimental Development Program

Guidance document on crop production in controlled environments

1. Introduction

The purpose of this document is to explain how scientific research and experimental development (SR&ED) tax credits apply to work performed in the controlled environment plant production sector, which includes the greenhouse, shade or cloche system, mushroom, and nursery industries. This document provides guidance on addressing certain technological and financial issues commonly encountered in this sector and will help the reader to:

- identify SR&ED work and distinguish it from non-SR&ED work; and
- comply with SR&ED program requirements when claiming work in this sector.

Visit www.cra-arc.gc.ca/txcrdt/sred-rsde/pblctns-eng.html on the Canada Revenue Agency (CRA) Web site for other documents that explain the requirements of the SR&ED program.

2. Definition of SR&ED

SR&ED is defined in subsection 248(1) of the *Income Tax Act* (ITA). Work in the areas of greenhouse production and horticultural practices in controlled environments meets the definition of SR&ED when it is performed for the purpose of achieving scientific or technological advancements using a systematic investigation or search by means of experiment or analysis.

The work may be:

- basic or applied research undertaken to advance scientific knowledge (paragraphs 248(1)(a) and (b) of the ITA);
- experimental development work undertaken to achieve technological advancements for the purpose of creating new, or improving existing, materials, devices, products, or processes (paragraph 248(1)(c) of the ITA); and
- certain related activities directly in support of and commensurate with the needs of the work above (paragraph 248(1)(d) of the ITA); but does not include certain activities (paragraphs 248(1)(e) to (k)).

2.1 Scientific or technological advancement

Typically, a grower undertakes SR&ED work after recognizing that the existing or available scientific knowledge or technology is inadequate to resolve a scientific or technological obstacle/uncertainty or to achieve the intended purpose. The available scientific knowledge or technology referred to above may represent the claimant's knowledge level or technology base, but could also be available in various sources such as:

- published scientific research, extension bulletins, and provincial publications available in the public domain;
- technical manuals and pamphlets from suppliers of seeds, chemical products, substrates, green-house equipments, etc;
- advice from university extension specialists or government greenhouse specialists or consultants;
- in-house expertise of the claimant's company; or
- specialized production protocols available in the public domain.

A scientific or technological advancement adds to this knowledge level or technology base with new knowledge that represents advancement in the understanding of scientific relations or a new capability that was not previously available or existing in the standard practice. This can be achieved by resolving a scientific or technological obstacle/uncertainty or attempting to achieve a scientific or technological advancement by experiment or analysis. The following are examples where new or improved products or processes may have resulted from work undertaken for the purposes of achieving scientific or technological advancements:

- a specific and not previously existing horticultural regimen to enhance production of a new tomato cultivar;
- an enhanced horticultural process in controlled environment production with advanced capabilities not currently established (for example, development and introduction of a micro-propagation system for reliable and efficient mass production of a plant species that is difficult to propagate); and
- a specific and currently unknown horticultural process to control a new fungal pathogen.

2.2 Scientific or technological objectives – Importance for identifying eligible work to claim.

To claim the resulting work as SR&ED, it is important to clearly identify the scientific or technological objective. Regardless of any business-oriented objectives, scientific and technological objectives need to indicate the nature of the underlying scientific or technological obstacles/uncertainties and attempts to resolve them. For example, the following would be appropriate objectives for the examples listed above:

- develop a specific cluster pruning and canopy maintenance regimen for maximizing production of a new tomato cultivar (indicating that there is a direct relationship between these specific horticultural methods and the yield response of this cultivar that was not known before);
- develop a micro-propagation process for uniform and consistent commercial production of *Mandevilla* sp. (indicating that development and introduction of a specific micro-propagation process resulted in efficient and uniform production of this specie); and
- identify the causal agent of a new pepper disease and develop measures to control it (as the causal agent was new, this may have required development of a new control measure).

It is important that the objective has a scientific or technological basis that is clearly identified. Otherwise, it would be difficult to accurately identify related SR&ED work and costs. For example, the following objectives are too general in nature and would not provide sufficient focus on the work relevant to the intended advancements identified above:

- develop an advanced growing method for a new tomato variety;
- improved production process for *Mandevilla* sp.; and
- dealing with a new pepper disease.

3. Claiming SR&ED work performed in the tax year

The grower must then identify the work that comprised the systematic investigation or search by means of experiment or analysis to achieve the intended scientific or technological advancement.

Work performed is grouped by SR&ED project in the SR&ED claim. An SR&ED project comprises a set of inter-related activities that collectively are necessary for the attempt to achieve the specific scientific or technological advancement defined for the project and are pursued through a systematic investigation or search by means of experiment or analysis in a field of science or technology related to this sector and performed by qualified individuals.

Only the work that is commensurate with the needs of the experiment can be claimed. Important factors to consider include:

- scientific or technological objectives;
- scientific or technological obstacles/uncertainties;
- the type of treatments studied or tested;
- experimental variables and parameters considered; and
- the minimum area of greenhouse or nursery space that is sufficient to test the experimental variables to arrive at a valid conclusion with respect to the intended scientific or technological advancement.

Furthermore, the personnel responsible for directing and performing the work should have suitable scientific and technical skills and experience.

Pertinent details on the work performed, such as techniques and procedures used, data collection, and analysis, must also be documented and saved as supporting information in order to substantiate the work. It is also important to save all relevant documents on the expenditures involved in performing the SR&ED work claimed. Documentation and other supporting materials are required to establish that the work was performed in a systematic manner to achieve the intended scientific or technological advancements. A typical SR&ED project must have some of the following types of substantiation:

- background literature related to the project objectives, project plan (including resource allocation records);
- notes on experimental procedures, test protocols;

- project note books and/or quantitative measurement data (including descriptions of technological obstacles encountered, problems resolved);
- test records, production data from control and test plots of the claimed work, results of data analyses;
- progress reports and final project reports;
- photographs of experimental set-ups, technical drawings;
- prototypes of equipment, physical samples, scrapped equipment or prototype; and
- any other relevant evidence that substantiates the SR&ED work.

See the *Guide to Supporting Technical Aspects of a Scientific Research and Experimental Development (SR&ED) Claim* under “Application policies and guides” at www.cra-arc.gc.ca/txcrdt/sred-rsde/pblctns-eng.html for more details and a list of supporting material.

It is also important that the grower identifies all employees directly engaged in the SR&ED work and the details of their work to account for the labour claimed. The term “directly engaged” refers to “hands-on” work. Refer to *Application Policy 96-06, Directly Undertaking, Supervising or Supporting v “Directly Engaged” SR&ED Salary and Wages*, for further explanation.

When growers are not sure whether a project meets the definition of SR&ED, they should contact their CRA office to request assistance and a preliminary opinion. See the CRA’s Web site for details on the Pre-Claim Project Review service.

4. Sector-specific issues

The following section provides guidance to claimants for distinguishing SR&ED work from ineligible work by addressing some issues commonly encountered in this sector. It also outlines some important financial considerations when making SR&ED claims.

4.1 Misconceptions on eligibility of some selected activities

As in many industries, research and development work in this sector is often conducted for a variety of reasons. In order to be SR&ED, the claimed work, even if it is for a business purpose, must address certain underlying scientific or technological obstacles/uncertainties in pursuit of advancement in technology or scientific knowledge through a systematic process of investigation or search by experiment or analysis. This process includes a scientific or technological objective or hypothesis; planned experiments or analysis; observations, results, and data; and conclusions that are objectively based on the analysis of the experimental data. Activities such as simple trial-and-error troubleshooting, or the optimization of known parameters do not meet the requirements of SR&ED.

The fact that a grower is applying a particular growing method for the first time does not make it SR&ED. Work is not SR&ED simply because it falls outside of the claimant’s routine commercial operation. For example, although non-routine for the grower, work

such as growing a new variety or applying or implementing known technology under different circumstances would not be eligible.

This is just one of several common misconceptions about the SR&ED program that can contribute to delays and difficulties in processing your claim. The following examples demonstrate other common misconceptions in identifying and claiming SR&ED.

4.2. Testing new varieties

A grower tests a newly developed variety recommended by a proprietor or seed supplier by planting two rows. The grower follows the recommendations and monitors the crop for a variety of traits or characteristics (for example, disease resistance, yield, fruit quality) to determine if the new variety is commercially promising. Based on the outcome of this trial, the grower decides whether the variety will be grown commercially.

This type of monitoring (although it may be done in a systematic manner) is undertaken for routine data gathering or for commercial purpose and not for the purposes of advancing technology or scientific knowledge. The seed company or plant breeder may have developed the new variety by performing SR&ED; however, the grower in this example is merely confirming existing knowledge pertaining to this new variety. In this case the basis of the trial is the need to render a business decision, and the grower does not need to resolve a scientific or technological obstacle/uncertainty in order to make that decision. Therefore, such work does not qualify as SR&ED.

4.3. Growing a new variety following a feasibility study

Following the testing of the new variety, the grower may feel that there is a good chance for commercial success with a crop and proceeds with the growing of this new variety on a commercial scale. Depending on the zone size that can be controlled in the greenhouse, anywhere from 2 to 10 acres or more is planted. The grower proceeds to monitor the growth of the crop and, depending on its performance, adjusts a number of parameters to guide the crop to optimal production. The optimization of a number of parameters is often called the ‘development of cultural management strategies or crop husbandry strategies’. However, greenhouse growers are generally aware of optimization techniques for parameters such as lighting, temperature, CO₂ and humidity. Also, the development and implementation of management protocols for controlling nutrient levels, de-leafing, thinning, and other operational practices are familiar to greenhouse growers. These approaches are part of standard practices applied by this industry sector.

Work with respect to cultural management or crop husbandry strategies can fall in the realm of SR&ED only if the existing and available know-how is limited to such an extent that the claimant needs to conduct a planned systematic investigation, by experiment or analysis, to overcome technological obstacles/uncertainties. An example of SR&ED could be investigations performed to determine the influence of available potassium or calcium levels on the effect of CO₂ enrichment on tomato yields. In such cases, it is

important to clearly establish how the SR&ED attempts to advance the existing know-how, knowledge and standard practices.

4.4. Disease and pest control

Often growers test or try new products such as bio-control agents that are newly introduced to the market. As the grower in this scenario often uses the product for the first time, or perhaps applies the strategy or product in a unique situation, the grower may have to make certain modifications or adjustments in order to optimize the process.

Optimization of greenhouse operational parameters and practices using existing data, known principles and available knowledge (standard practice) to maximize the effectiveness of a strategy or product is not SR&ED. The work can be SR&ED only when the grower goes beyond standard and known practices by:

- (i) approaching disease and pest control in a new, not previously known way; or
- (ii) seeking new scientific knowledge through a systematic investigation using various treatments and a control in order to resolve a scientific or technological obstacle/uncertainty in pursuit of a scientific or technological advancement.

4.5. Technology transfer

Merely testing a new technology that has been developed and used elsewhere does not meet the requirements of SR&ED. Several techniques or technologies (for example, intercropping, growing crops year-round, and raised-trough and high-wire technologies) are relatively new technologies, but they have been used successfully in greenhouse or agricultural situations. Applying known technologies in a new or different situation generally does not constitute SR&ED.

However, while testing, trying, or implementing new technology, one may encounter certain unexpected technological deficiencies or opportunities that translate to technological obstacles/uncertainties. If additional work is performed to address these, the claimant should determine whether that additional work is eligible SR&ED. Typically, the SR&ED project work would not begin until the technological obstacles/uncertainties have been clearly identified. It is advisable to document this for the purpose of establishing the start of the project work.

4.6. Start and end of an SR&ED project

An SR&ED project starts only when a scientific or technological obstacle/uncertainty is identified and its resolution is sought, or when a technological advancement is sought, through a systematic investigation (and the work is performed accordingly). Not knowing the outcome of testing a new crop or technique or the effect of new pest controls is not specific enough to constitute a scientific or technological obstacle/uncertainty. Hence, the SR&ED project does not necessarily start when a crop is planted.

For example, trying raised-trough technology on flowers (the technology is mostly used for tomatoes) and following guidelines provided by an expert does not in itself define the start of an SR&ED project. It does not begin until such time that a scientific or technological obstacle/uncertainty is identified and a systematic investigation is undertaken to overcome or resolve it, thereby achieving a scientific or technological advancement.

An SR&ED project normally ends when a specific scientific or technological obstacle/uncertainty is resolved, an attempt to achieve a technological advancement has been carried out, or when the project is terminated for some other reason. Work-related documents that establish both the start and the end of an SR&ED project should be maintained.

4.7. Scope of SR&ED work

It is important to understand that not all trials or tests are part of an SR&ED project. In order for a trial or test to be eligible, it must be a necessary part of the systematic investigation leading to a scientific or technological advancement including the ones performed to resolve a scientific or technological obstacle/uncertainty.

For example, a grower may learn that the total solids content and shelf life of tomato crops can be improved by using elevated levels of potassium, anywhere from two to five times the normal concentration. The grower decides to apply 300 ppm of potassium to the entire crop instead of the normal application of 100 ppm. This grower is not performing SR&ED. The general knowledge that using elevated levels of potassium improves the crop is publicly available. Implementing existing knowledge and techniques in one's commercial operations is not a technological advancement. The fact that the grower used the entire crop for this trial is indicative that the purpose of the trial was to produce a commercial crop. Further, the absence of a control group and other measures of a systematic approach indicate that this trial is not part of an SR&ED project.

For work to be eligible SR&ED, it must represent a systematic investigation or experimental approach that identifies a scientific or technological objective or obstacle/uncertainty and sets about to systematically test a number of variables to determine how to advance the technology. Such work could include, for example, various treatments and a control against which the treatment effects are measured.

For example, a grower normally uses potassium levels ranging from 50-100 ppm (depending on the stage of the tomato crop), and the grower would like to test the hypothesis that applying higher amounts during the fruit-bearing stage will increase the total solids of tomato fruit and thus enhance the shelf life of the tomato. The work may include testing potassium levels at 200, 250, 300, 350, 400, and 500 ppm as separate concurrent treatments (vs. 100 ppm as the control) and analyzing the total solids content, and determining its correlation with shelf life of the tomato fruits under different storage conditions. As this work directly corresponds to the technological objective of testing the hypothesis, it can be claimed as SR&ED work. The plot and sample sizes used must also

be reasonable in respect of the SR&ED objective. This topic is addressed more thoroughly in a later section.

Any commercial activity, such as measuring total yield and tomato grade-outs, that are unrelated to the set objectives - in this case, measuring the effect of higher than currently used potassium levels on the total solids and shelf life - should not be part of the SR&ED claim. Data, such as total yields and grade-outs, are recorded as a part of normal business practice.

As previously explained, the SR&ED work claimed must be commensurate with specific technological or scientific objectives of the project leading to the intended technological advancements.

4.8. Experimental production (EP) vs. commercial production with experimental development (CP+ED)

SR&ED can be conducted in commercial facilities, but any work with respect to the commercial production of a new or improved product, or the commercial use of a new or improved process, is specifically excluded from being SR&ED by law. Paragraph 248(1)(i) of the ITA states that work with respect to commercial production must be excluded from an SR&ED project. Therefore, when a grower performs SR&ED during commercial crop production, any work associated with the commercial production cannot be claimed as SR&ED. When SR&ED is conducted in a commercial facility, eligible experimental development work must be distinguished from ineligible commercial activities.

For example, where SR&ED work is done during a commercial production cycle to achieve incremental process improvement and the commercial product or process is not at risk, the context could be considered commercial production with experimental development (CP+ED). In such a trial, the grower conducts the trial knowing that a commercial crop will be produced. Most of the work and expenditures associated with such trials would not qualify as SR&ED since these are associated with commercial production. Only the incremental work and costs directly attributable to the SR&ED could be claimed. To determine the eligible expenditures in such projects, the SR&ED work and the non-SR&ED work should be identified and the project costs allocated between these categories of activities.

If a trial is undertaken solely for SR&ED purposes and there is a technical risk to the product or process stemming from the SR&ED work, it is expected that the grower would take measures to reduce the risk to its production by limiting the size of the trial area and not intending to produce crop for commercial sale. Such a crop that is produced could be considered to be experimental production (EP) if it is required to verify whether the technological objectives of the SR&ED work have been met and/or if a technological advance is achievable, and the purpose of the trial was to evaluate scientific or technological aspects of the SR&ED project. Accordingly, the resulting sale of the EP is incidental or secondary to carrying out the SR&ED project.

Application Policy 2002-02R2 “*Experimental Production and Commercial Production with Experimental Development Work – Allowable SR&ED Expenditures*”, sets a methodology to determine if the context of a trial performed as part of an SR&ED project is EP or if the trial is commercial production with SR&ED being performed at the same time (CP+ED).

For the purposes of determining whether the context of a trial is EP or CP+ED, the onus is on the claimant to produce a rationale that includes all pertinent factors and technical considerations involved in making that determination. It is necessary to have a clear statement of the scientific or technological objective of the SR&ED project and how this objective will be achieved through a systematic investigation. It is also necessary to provide clear rationale demonstrating the type, size and extent of tests or trials undertaken as part of this systematic approach. Suitable records that were generated during the trials that demonstrate a systematic experimental approach to conducting the SR&ED project work must support these statements.

The design of the experiment may be limited by greenhouse constraints, such as the set-up area being limited to a heated or irrigated zone. For example, experiments involving plant cultivars might use two rows, while work involving irrigation and nutrient variables might use a zone or circuit depending on the set-up of the facility. Once again, the methodology used in determining the production context (EP or CP+ED) must be supported by contemporaneous documentation (this supporting information would typically be created during the trial periods of the SR&ED project).

5. Financial considerations

There are a number of financial considerations that arise in claims in the controlled environment crop or plant production sector, specifically when SR&ED is conducted while a commercial crop is being grown. Some of the common concerns and considerations are summarized below.

5.1. Sample or plot size used

The plot or sample size that the grower uses to test the hypothesis or conduct experimental trials becomes an important issue for costing purposes. It is important that the sample size be supported by a scientific rationale.

Only the cost related to a sample size that is commensurate with the technical needs of a project and directly in support of the project’s scientific or technological objectives would be allowable for SR&ED purposes. If a larger sample size is chosen for other reasons, the claimant must provide a justification (see item 4.8 above).

Briefly, if the context of a treatment plot is determined to be CP+ED, the incremental costs of labour, materials, and other expenditures related to the SR&ED work performed may qualify. The incremental labour, materials, and other expenditures must be

specifically identified and be supported by suitable documentation. If the context of a treatment plot is determined to be EP and the plot size is commensurate with the needs of the scientific or technological objectives (with no excess production), the costs for labour, materials, and other expenditures attributable to that treatment plot may qualify. For more details, refer to the CRA's Application Policy AP 2002-02R2 "*Experimental Production and Commercial Production with Experimental Development Work – Allowable SR&ED Expenditures*". It is important that all related technical and financial information on the control and treatment plots be maintained to substantiate the claim.

5.2. Direct labour

Labour costs relating to the SR&ED work done by the claimant are allowable SR&ED expenditures, subject to the expenditure rules under either the proxy or the traditional method elected by the claimant. See *Interpretation Bulletin IT-151R5* at www.cra-arc.gc.ca/txcrdt/sred-rsde/pblctns-eng.html for details on this topic and other expenditure rules.

Labour activities performed while growing a commercial crop are not allowed for SR&ED purposes. Therefore, labour such as preparing the plot or greenhouse, planting, plant care, and harvesting, which would have occurred as part of the normal commercial crop cycle, would not be allowed for SR&ED purposes.

Allowable labour activities for SR&ED work would generally be related to hypotheses development, planning, data collection, and data analysis. This work must be over and above commercial activities and be directly related to the SR&ED work carried out (for example, extra labour involved in a special cluster pruning performed in a tomato crop as a treatment, and its effects measured against control) and it should be documented.

Where a claimant uses the proxy method, amounts paid to non-technical employees involved in an SR&ED project will be allowed, provided they are supervised by qualified staff conducting the SR&ED. In addition, the labour related to SR&ED work needs to be expressed as actual time spent on these activities (for example, hours per week). It is advisable to keep suitable documentation on the personnel and specific work they performed, as unsupported estimates are not acceptable.

If the context of a treatment plot is CP+ED, even when the SR&ED work causes crop failure or excessive plant mortality when compared to the control plot, only the incremental labour costs would qualify. Labour costs related to work that would otherwise have been performed to produce the commercial crop are attributable to the commercial production and would not be allowable for SR&ED purposes.

5.3. Materials

Where the project involves SR&ED performed during commercial production, only incremental materials consumed or transformed due to SR&ED are eligible. Materials

that would in any case have been consumed or transformed in growing the commercial crop are not attributable to SR&ED.

If the context of a treatment plot is CP+ED, the incremental costs of materials consumed or transformed while performing SR&ED may qualify. The incremental materials must be specifically identified and be supported by suitable documentation.

If the context of a treatment plot is EP and the plot size is commensurate with the needs of the scientific or technological objectives (with no excess production), the cost of materials related to the SR&ED work may qualify. It is advisable to keep all related technical and financial information on the control and treatment test plots.

If the context of a treatment plot is CP+ED, and the SR&ED work causes crop failure or excessive plant mortality when compared to the control plot, the costs related to materials consumed or transformed while performing the SR&ED work (for example, plant material, fertilizers) may qualify. Otherwise, only the costs related to incremental material would qualify. In these cases, plant loss or excessive mortality in an experimental plot must be established based on simultaneous comparison with the control plot.

5.4. Documentation

Along with technical documentation, claimants should keep adequate documentation to establish how expenditures are related to the claimed work and how the amounts were determined. Having little or no documentation, or having only documentation that is normally maintained (such as yields) for commercial purposes, will not likely provide adequate support for the expenditures being claimed for SR&ED.

For example, if 50% of the grower's salary is claimed as SR&ED related, the grower must be able to demonstrate how that percentage was arrived at and why it is reasonable. For instance, if the experimental plot is 2 acres and the whole greenhouse is 20 acres, it would be difficult to conclude that 50% of the grower's salary relates to SR&ED without additional documentation supporting the work actually performed. Further, if the grower is claiming incremental SR&ED expenditures, the amounts could be supported by using cost comparisons with a control or commercial plot. Similarly, the incremental portion of the materials consumed in the prosecution of SR&ED must also be substantiated.

5.5. Multi-party SR&ED

If a grower or a group of growers participates in a multi-party SR&ED project being conducted by an educational institution or government research organization such as Agriculture and Agri-Food Canada (AAFC), only the cost related to incremental work performed by the grower in respect of the SR&ED project would be considered as a third-party payment for SR&ED purposes.

For example, if an experiment is set up in a greenhouse range of a grower, the work that the grower performs for the AAFC's SR&ED project (for example, collecting data, setting up unconventional growing systems) that is over and above what would have been done for commercial production would be allowed. Contributions (both "in-kind" as well as monetary) are considered to be third-party payments.

It is important to note that, in a formal collaborative arrangement between several growers, the work performed by each grower has to meet the requirements of SR&ED on its own merit. In these situations, growers would normally enter into an agreement that would specify the work to be done by each grower with respect to a larger project. Eligibility would be determined based on the work performed by a particular grower and would not be based on the total body of work performed by all growers under the collaborative agreement.

5.6. Research contributions through check-off

If a grower belongs to a commodity association that invests funds in research activities collected through check-off, the portion used for research may in some cases be claimed as a third-party payment for SR&ED purposes. For example, a grower's total check-off amount was \$3,500. Of this, the commodity association used \$1,200 toward a \$180,000 contribution to a university to support an approved research project. This was communicated to the grower, so the grower now can claim a check-off payment of \$1,200 as a third-party payment for SR&ED purposes. Details on check-off payments can be found in the following documents available under "Sector-specific guides" at www.cra-arc.gc.ca/txcrdt/sred-rsde/pblctns-eng.html :

- *SR&ED Investment Tax Credits for Farm Producers*
- *Information for Agricultural Organizations and Farm Producers on Access to SR&ED Investment Tax Credits*

6. Other ineligible work

In addition to some of the ineligible work identified in the sections above, the following situations involve work that does not satisfy the requirements of SR&ED under subsection 248(1) of the ITA:

- work undertaken to resolve uncertainty related to lack of personal experience with a growing method or product;
- work undertaken to address uncertainty in business opportunities or market factors alone;
- work undertaken outside Canada (prior to February 28, 2008); and
- activities of a purely commercial nature.

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For more information on the SR&ED program, visit www.cra-arc.gc.ca/sred/