ENVIRONMENTAL PROTECTION AGENCY

[OPP–30000/42A; FRL–6496–3]

Triphenyltin Hydroxide; Proposed Determination To Terminate Special Review

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed Determination to Terminate Special Review.

SUMMARY: This Notice sets forth EPA's preliminary determination regarding the continued registration of pesticide products containing triphenyltin hydroxide (TPTH) and sets forth the Agency's assessment of the risks and benefits associated with pesticidal uses of TPTH. On January 9, 1985, the Agency issued a Notice of Special Review of pesticide products containing triphenyltin hydroxide based on developmental toxicity (teratogenicity) concerns (50 FR 1107). Although not a subject of the Special Review, the Agency also cited concerns for reproductive toxicity, carcinogenicity, immunotoxicity, inhalation toxicity and adverse effects to non-target organisms in the Position Document 1. Due to voluntary actions by the registrants that have reduced worker exposure to TPTH, as well as additional data that refine the risk assessment, EPA has determined that the risks of using TPTH are substantially lower than when the Special Review was initiated in 1985. This Notice proposes to terminate the triphenyltin hydroxide Special Review based on the Agency's determination that the benefits of TPTH use outweigh the risks.

DATES: Comments, data and information relevant to the Agency's proposed decision, identified by the docket control number [OPP–30000/42A], must be received on or before November 20, 2000.

ADDRESSES: Comments may be submitted by mail, electronically, or in person. Please follow the detailed instructions for each method as provided in Unit I. of the **SUPPLEMENTARY INFORMATION.** To ensure proper receipt by EPA, it is imperative that you identify docket control number OPP–30000/42A in the subject line on the first page of your response.

FOR FURTHER INFORMATION CONTACT: Phil Budig, Special Review and Reregistration Division (7508C), Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460. Telephone (703) 308–8029; e-mail address: budig.phil@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does This Action Apply to Me?

You may be affected by this action if you are a pesticide registrant with registered products which contain triphenyltin hydroxide as an active ingredient, or if you are an agricultural producer or a mixer, loader or applicator using products containing triphenyltin hydroxide as an active ingredient. Since other entities may also be interested, the Agency has not attempted to describe all the specific entities that may be affected by this action. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed under **FOR FURTHER INFORMATION CONTACT.**

B. How Can I Get Additional Information, Including Copies of Support Documents

1. *Electronically*. You may obtain electronic copies of this document, and certain other related documents that might be available electronically, from the EPA Internet Home Page at http://www.epa.gov/. To access this document, on the Home Page select ''Laws and Regulations,'' ''Regulations and Proposed Rules,'' and then look up the entry for this document under the ''**Federal Register**—Environmental Documents.'' You can also go directly to the **Federal Register** listings at http://www.epa.gov/fedrgstr/.

2. *In person*. The Agency has established an official record for this action under docket control number OPP–30000/42A. The official record consists of the documents specifically referenced in this action, any public comments received during an applicable comment period, and other information related to this action, including any information claimed as Confidential Business Information (CBI). This official record includes the documents that are physically located in the docket, as well as the documents that are referenced in those documents. The public version of the official record does not include any information claimed as CBI. The public version of the official record, which includes printed, paper versions of any electronic comments submitted during an applicable comment period, is available for inspection in the Public Information and Records Integrity Branch (PIRIB), Rm. 119, Crystal Mall #2, 1921 Jefferson Davis Hwy., Arlington, VA, from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The PIRIB telephone number is (703) 305–5805.

3. *By mail*. You may request copies of this document and supporting documents by writing to: Public Information and Records Integrity Branch, Information Resources and Services Division (7502C), Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460. Be sure to include docket control number [OPP–30000/42A] in your request.

C. How and to Whom Do I Submit Comments?

You may submit comments through the mail, in person, or electronically. To ensure proper receipt by EPA, it is imperative that you identify docket control number OPP–30000/42A in the subject line on the first page of your response.

1. *By mail*. Submit your comments in triplicate to: Public Information and Records Integrity Branch (PIRIB), Information Resources and Services Division (7502C), Office of Pesticide Programs (OPP), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

2. *In person or by courier*. Deliver your comments to: Public Information and Records Integrity Branch (PIRIB), Information Resources and Services Division (7502C), Office of Pesticide Programs (OPP), Environmental Protection Agency, Rm. 119, Crystal Mall #2, 1921 Jefferson Davis Hwy., Arlington, VA. The PIRIB is open from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The PIRIB telephone number is (703) 305–5805.

3. *Electronically*. You may submit your comments electronically by e-mail to: *''opp-docket@epa.gov,''* or you can submit a computer disk as described above. Do not submit any information electronically that you consider to be CBI. Avoid the use of special characters and any form of encryption. Electronic submissions will be accepted in WordPerfect 6.1/8.0 or ASCII file format. All comments in electronic form must be identified by docket control number OPP–30000/42A. Electronic comments may also be filed online at many Federal Depository Libraries.

D. How Should I Handle CBI That I Want to Submit to the Agency?

Do not submit any information electronically that you consider to be CBI. You may claim information that you submit in response to this document as confidential by marking any part or all of that information as CBI. Information so marked will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

A copy of the comment that does not contain CBI must be submitted for inclusion in the public version of the official record. Information not marked confidential will be included in the public version of the official record without prior notice.

E. What Should I Consider as I Prepare My Comments for EPA?

You may find the following suggestions helpful for preparing your comments:

• Explain your views as clearly as possible.

• Describe any assumptions you used.

• Provide copies of technical information or data that support your views.

• If you estimate potential burden or costs, explain how you arrived at the estimate you provide.

• Provide specific examples to illustrate your concerns.

• Offer alternative ways to improve the Agency's proposed action.

• Make sure to submit your comments by the deadline in this notice.

• To ensure proper receipt by EPA, be sure to identify the docket control number assigned to this action in the subject line on the first page of your response. You may also provide the name, date, and **Federal Register** citation.

II. Introduction

Triphenyltin hydroxide is most commonly sold under the trade names Super Tin®, Pro-Tex®, Photon®, and Brestan H®. TPTH is formulated both as a wettable powder in a water-soluble pack and as a flowable concentrate requiring a mechanical transfer (ground equipment applications) or closed system (aerial and chemigation applications) for mixing and loading.

Triphenyltin hydroxide was first registered as a fungicide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) in 1971 and is a non-systemic protectant foliar fungicide currently registered for use on pecans, potatoes and sugarbeets. The fungicide was formerly registered for use on carrots, peanuts and tobacco. These uses were subsequently canceled and the appropriate tolerances were revoked. In addition to fungus control, TPTH is also registered as a suppressant of Colorado potato beetle populations on potatoes.

Triphenyltin hydroxide is classified by EPA as a Restricted Use pesticide [Ref. 1] due to acute and developmental toxicity concerns. Under section 3(d) of FIFRA this means, among other things, that only certified applicators trained for and familiar with pesticide use, or persons under their direct supervision, can use products containing TPTH.

A Special Review was initiated in 1985 to address the use of triphenyltin hydroxide and examine the developmental toxicity risk to mixers, loaders and applicators. Since the time the Special Review was initiated, the Agency has identified carcinogenicity as an endpoint of concern and the registrant has voluntarily taken actions that have reduced worker exposure to TPTH. These actions include deletion of certain uses, closed mixing/loading systems for aerial applications, addition of protective clothing requirements to labels, adoption of mechanical transfer systems for all liquid formulations, packaging of the wettable powder formulation in water soluble packets, and reduced maximum seasonal application rates. In addition, the registrant submitted additional data, including a dermal developmental toxicity study and an occupational exposure monitoring study for pecan mixer/loaders and pecan harvesters, to refine the exposure estimates for this site.

EPA has refined its risk assessments for both developmental and cancer concerns, and completed its risk/benefit analysis of TPTH. Taking into account all of the worker mitigation measures that have been adopted since the initiation of the special review, the Agency has determined that the risks of using TPTH are no longer unreasonable. Consistent with this finding, the Agency published its Reregistration Eligibility Decision (RED) for TPTH in the **Federal Register** of December 1, 1999 (64 FR 67265) (FRL–6395–3) [Ref. 2], finding all uses of registered products eligible for reregistration. As the benefits from continued use of TPTH outweigh the risks, the Agency is proposing to terminate the Special Review.

A. Legal Background

In order to obtain a registration for a pesticide under FIFRA, an applicant must demonstrate that the pesticide satisfies the statutory standard for registration. The standard requires, among other things, that the pesticide will not cause ''unreasonable adverse effects on the environment'' [FIFRA section 3(c)(5)]. The term ''unreasonable adverse effects on the environment'' means ''any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide'' [FIFRA section 2(bb)]. This standard requires a finding that the benefits of each use of the pesticide outweigh the risks of such use, when the pesticide is used in compliance with the terms and conditions of registration and in accordance with commonly recognized practices.

The burden of proving that a pesticide satisfies the statutory standard is on the proponents of registration and continues as long as the registration remains in effect. Under FIFRA section 6, the Administrator may cancel the registration of a pesticide or require modification of the terms and conditions of a registration if (s)he determines that the pesticide product causes unreasonable adverse effects to man or the environment. EPA created the Special Review process to facilitate the identification of pesticide uses that may not satisfy the statutory standard for registration and to provide a public procedure to gather and evaluate information about the risks and benefits of these uses.

A Special Review may be initiated if a pesticide meets or exceeds the risk criteria set out in the regulations at 40 CFR part 154. EPA announces that a Special Review is initiated by publishing a notice, Position Document 1 (PD 1), in the **Federal Register**. After a PD 1 is issued, registrants and other interested persons are invited to review the data upon which the review is based and to submit data and information to rebut EPA's conclusions by showing that EPA's initial determination was in error, or by showing that use of the pesticide is not likely to result in unreasonable adverse effects on human health or the environment. In addition to submitting rebuttal evidence, those interested may submit relevant information to aid in the determination of whether the economic, social and environmental benefits of the use of the pesticide outweigh the risks. After reviewing the comments received and other relevant materials obtained during the Special Review process, EPA makes a decision on the future status of registrations of the pesticide.

The Special Review process may be concluded in various ways depending upon the outcome of EPA's risk/benefit assessment. If EPA concludes that all of its risk concerns have been adequately rebutted, the pesticide registration will be maintained unchanged. If, however, all risk concerns are not rebutted, EPA will proceed to a full risk/benefit assessment for non-dietary risks. In determining whether the use of a pesticide poses risks that are greater than the benefits, EPA considers possible changes to the terms and conditions of registration that can reduce risks to the level where the benefits outweigh the risks, and it may require that such changes be made in the terms and conditions of the registration. Alternatively, EPA may determine that no changes in the terms and conditions of a registration will adequately assure that use of the pesticide will not cause any unreasonable adverse effects. If EPA makes such a determination, it may seek cancellation, suspension, or change in classification of the pesticide's registration. This determination would be set forth in a Notice of Final Determination issued in accordance with 40 CFR 154.33.

Issuance of this Notice means that the Agency has assessed the potential adverse effects associated with the uses of triphenyltin hydroxide and has preliminarily determined that the benefits override the risks.

B. Regulatory Background

The Registration Standard for TPTH was published in September 1984 [Ref. 1]. The Standard established the restricted use classification based on concerns of acute and developmental toxicity; announced EPA's intent to initiate a Special Review based on developmental toxicity risks to workers; imposed label warnings regarding developmental toxicity and potential adverse ecological effects; established a 24-hour reentry period; and required submission of product chemistry, toxicology, residue chemistry, environmental fate, and ecological effects data.

On October 23, 1984, EPA issued a letter notifying the TPTH registrants that the Agency was concerned about developmental effects from TPTH and was considering placing the fungicide into Special Review. On January 9, 1985, the EPA issued a notice to initiate a Special Review based on potential developmental toxicity risks to mixers, loaders and applicators for registrations of products containing TPTH (50 FR 1107). This document, also referred to as Position Document 1 or PD 1, detailed the basis for the Agency's decision to initiate a Special Review. The Agency determined that all uses would be the subject of the Special Review for TPTH. The Agency had reviewed data concerning the potential adverse effects associated with uses of TPTH that indicated that TPTH produces developmental toxicity effects in laboratory animals and had determined that pesticide products containing TPTH met or exceeded the risk criterion that, under regulations then in effect, would require EPA to initiate a Special Review (40 CFR 162.11(a)(3)(ii)(B) (1975)). Current regulations in 40 CFR 154.7(a)(2) (1985), set forth a similar criterion for initiation of a Special Review by EPA. The PD 1 also noted EPA concerns for reproductive toxicity, carcinogenicity, immunotoxicity, inhalation toxicity and adverse effects to non-target organisms, however, these were not cited as grounds for initiating Special Review.

Since initiating the TPTH Special Review the Agency completed the TPTH Reregistration Eligibility Decision (RED) in November 1999. Although not triggers for Special Review, the TPTH RED assessed dietary and ecological risk, along with occupational risk. The Agency did not identify any dietary risks of concern at the time of the PD 1. However, the TPTH RED assessed dietary risks on the basis of more recent data under the Food Quality Protection Act of 1996. While the Agency found that dietary risks from food consumption were acceptable, it could not rule out the potential for dietary risk through drinking water exposures from surface water sources. This potential risk was addressed through buffer zones from water bodies to prevent TPTH run-off into surface water. With these mitigation measures in place, the Agency has determined that there is a reasonable certainty of no harm from TPTH use on sugarbeets, potatoes, and pecans [Ref. 2]. The Agency also noted in the PD 1 that TPTH is highly toxic to aquatic invertebrates, warmwater fish and estuarine/marine organisms, and moderately to highly toxic to avian species. While insufficient data on these effects were available to trigger a special review, the Registration Standard required additional studies to clarify the environmental fate and potential ecological effects of TPTH. These studies were reviewed as part of the RED. As a result of this review, the registrants amended their labels to mitigate risks to non-target organisms through reductions in the maximum seasonal use of TPTH on pecans, sugarbeets, and potatoes, as well as through a 100 foot buffer from water bodies for ground applications of TPTH, and a 300-foot buffer from water bodies for aerial applications of TPTH [Ref. 2]. This document focuses on reproductive and cancer risk to workers, as occupational risks triggered the initiation of the TPTH Special Review in 1985.

C. Summary of EPA's Proposed Action

EPA has determined that the benefits associated with the continued use of TPTH under the current terms of TPTH's registration outweigh the risks. Thus, EPA is proposing to terminate the Special Review of TPTH.

III. Summary of Toxicological Concerns

The Special Review of TPTH was initiated in 1985 because of data indicating that TPTH produces developmental toxicity effects in laboratory animals and concerns about the adequacy of the carcinogenicity assessment. The Agency's Registration Standard required additional testing to verify the potential for TPTH to induce developmental and carcinogenic effects [Ref. 1]. This section summarizes the Agency's current assessment of developmental and carcinogenic issues. [For a fuller treatment of the toxicity endpoints see Refs. 2 and 3].

A. Developmental Effects

Studies submitted in response to the Registration Standard, including studies in rabbits [Ref. 4], rats [Refs. 5, 6, 7, 8, and 9] and hamsters [Ref. 10], were reviewed and determined to be acceptable for evaluating the potential for assessing maternal and developmental effects in these three species [Ref. 3]. In a document dated January 9, 1991, the Peer Review Committee for Reproductive and Developmental Toxicity concluded that these studies establish no-observed-adverse-effect level (NOAEL) and lowest-observed-adverse-effect levels (LOAELs) for maternal and developmental effects in all three species, with the rabbit being the most sensitive [Ref. 11].

The lowest NOAEL for developmental toxicity in rabbits was established at 0.3 mg/kg/day based on decreased pup weight and the presence of unossified hyoid in the rabbit fetuses at the LOAEL of 0.9 mg/kg/day [Ref. 7]. The lowest maternal toxicity NOAEL was 0.1 mg/kg/day based on decreased maternal body weight gain in rabbits at the LOAEL of 0.3 mg/kg/day. It was noted that 2 mg/kg/day could not be tolerated in the rabbit since there were compound related resorptions to preclude fetal examinations.

Several rat studies were performed and reviewed, and some of these included postnatal development phases. The rat was less sensitive than the rabbit with a NOAEL of 1 mg/kg/day for maternal toxicity (decreased body weight gain) occurring at 2.8 mg/kg/day. The developmental NOAEL in rats was inconsistent among the several studies being either 1.0 or 2.8 mg/kg/day with a LOAEL of either 2.8 or 8 mg/kg/day since not all of the same effects in the developing fetuses were seen in each study. At higher doses there was deceased fetal weight and increased resorptions and fewer pups. The new rat developmental toxicity studies did not show consistency in induction of hydrocephaly and hydroureter or skeletal effects. Hamsters were still less sensitive than the rabbit and rat with a NOAEL of 5.08 and 12 mg/kg/day for both maternal and developmental toxicity, with maternal body weight being affected at the LOAEL. Decreased fetal weight and viable fetuses and an increase in minor skeletal effects were noted in offspring.

Subsequent to the 1991 peer review meeting, the Agency requested a developmental toxicity study by the dermal route in rabbits since extrapolation of the rabbit oral toxicity study resulted in unacceptable margins of exposure. The dermal developmental toxicity study [Ref. 12] established a NOAEL of 3.0 mg/kg/day for both maternal and developmental toxicity since there were no effects at this level, which was the highest dose level tested.

B. Carcinogenicity

In the PD 1, the Agency indicated some concern about the carcinogenic effects of TPTH and did not consider the existing data base adequate for carcinogenicity assessment. The registrant subsequently submitted replacement rat [Ref. 13] and mouse [Ref. 14] studies.

1. *Classification of carcinogenic potential*. The Carcinogenicity Peer Review Committee (CPRC) met on November 29, 1989, to conduct a weight-of-the-evidence review of the data, including the replacement rat and mouse carcinogenicity studies and mutagenicity data. The CPRC concluded that TPTH was a B2 carcinogen with a Q_1^* of 2.8 $(mg/kg/day)^{-1}$ [Ref. 15]. These conclusions were based on the following: the significant increase in fatal pituitary gland adenomas in female rats and Leydig cell tumors in male rats; and, the significantly increased incidence of hepatocellular adenomas and combined adenomas and/or carcinomas in male and female mice, a significantly increasing dose-related trend for the incidence of hepatocellular carcinomas in female mice. Other factors considered by the Peer Review Committee included: the uncommon spontaneous occurrence of hepatocellular carcinomas in female mice; an increase in tumor incidences at relatively low dose levels of TPTH; and evidence for immunotoxicity of the chemical [Ref. 15].

2. *Potency factor* (Q_1^*). The CPRC revisited TPTH on March 18, 1992, to reconsider the basis for quantification of the cancer unit risk values of TPTH [Ref. 16]. This latter CPRC meeting was conducted to address the conclusion of the September 18, 1991, FIFRA Science Advisory Panel (SAP) meeting that the pituitary tumor data were equivocal, due to the high spontaneous incidence of these tumors in the female rat. The SAP also commented that the cancer dose-response quantification for pituitary tumors should consider differences in mortality.

On March 18, 1992, CPRC members agreed to support their previous conclusion that TPTH should be classified as a B2 carcinogen with the Q_1^* based on fatal pituitary gland adenomas [Ref. 16]. The Committee's decision was supported by the conclusion that the pituitary gland tumors had an early onset and were fatal. Thus a Q_1^* of 2.8 $(mg/kg/day)^{-1}$ was determined using the multistage Weibull (time to tumor) model because this model is considered the most appropriate when there is a significant differential in mortality. In the original Q_1^*, a 2/3 scaling factor was used to extrapolate from animals to humans. The unit risk value was subsequently revised to a Q_1^* of 1.83 $(mg/kg/day)^{-1}$ to reflect current Agency policy of a 3/4 interspecies scaling factor.

3. *Mutagenicity*. TPTH is not considered to have a mutagenicity/genetic toxicity concern. Most studies are negative for mutagenic/genetic toxicity effects. Although there were some apparent positive responses, other tests, particularly *in vivo*, conducted to verify the significance of the apparent studies *in vitro* were negative [Refs. 2 and 17].

C. Immunotoxicity

TPTH belongs to a class of chemicals (organotins) known to be immunotoxic. The primary treatment related effects via oral exposures are immunotoxicity as indicated by decreases in lymphocytes and immunoglobulins in rats and mice, following both sub-chronic and chronic exposures. To better characterize potential immunotoxic effects, the Agency has called in a special developmental immunotoxicity study as part of its reregistration eligibility decision.

D. Summary of Endpoints

The endpoints used in assessing the occupational risks for TPTH are presented in Table 1 [Ref. 18].

TABLE 1.— ENDPOINTS FOR ASSESSING OCCUPATIONAL RISKS FOR TPTH

Exposure Routes	Exposure Duration	Dose (mg/kg/day)	Effect	Study	Uncertainty Factor	Comment
Dermal	Short-term (1–7 days)	NOAEL 3.0	No effect observed at the highest dose tested	Dermal developmental toxicity (rabbit)	100	Route-specific study; MOE based on UF for inter-species (10x) extrapolation and intra-species variability (10x)
Dermal	Intermediate-term (1 week to several mos)	NOAEL 3.0	No effect observed at the highest dose tested	Dermal developmental toxicity (rabbit)	100	Route-specific study; MOE based on UF for inter-species (10x) extrapolation and intra-species variability (10x)
Inhalation	Any time period	NOAEL 0.092[a]	Death following lung lesions	Subchronic inhalation study (rat)	100	Route-specific study; MOE based on UF for inter-species (10x) extrapolation, intra-species variability (10x)
Dermal & Inhalation.	Cancer Risk	Oral Q_1^* 1.83 $mg/kg/day^{-1}$	Probable human carcinogen	Oral cancer rat and mouse studies showing pituitary, testicular, and liver tumors.	NA	A dermal absorption of 10% should be used. Based on comparison between rabbit oral and dermal studies. Inhalation absorption assumed to be 100%.

[a] Inhalation dose in mg/L was converted to mg/kg/day using the following equation: Dose (mg/kg/day) = (NOAEL (0.00034 mg/L)* Respiration rate of a young adult Wistar rat (8.46 L/hr) * Study daily exposure duration (6 hr/day)) / Body weight of a young adult Wistar rat (0.187 kg)

IV. Occupational Exposure and Risk

A. Position Document 1

In the January 1985 Notice of Special Review (PD 1), the Agency concluded that potential developmental toxicity risks to mixers, loaders and applicators for registrations of products containing triphenyltin hydroxide may result in unreasonable adverse effects. The Agency's risk analysis was limited to dermal exposure to TPTH resulting from air blast application to pecan trees, as this was the use pattern expected to generate the most exposure to workers. This analysis was based on exposure estimates derived from Agency data and assumed dermal absorption would be 100%.

When conducting the 1985 risk assessment, the Agency assumed that all workers were unprotected, wore cotton work clothes, short-sleeved shirts, long pants and no hat, gloves or respirator. Three-thousand square centimeters of the body surface was assumed to be uncovered. Applicator exposure was calculated from a linear regression correlation derived from Agency data for the air blast application to orchards. The Agency's assumptions were conservative and may have overestimated actual exposure.

The Agency estimated a typical exposure value for a mixer/loader/applicator of 0.74 mg/kg/day, based on ranges of 0.68 to 0.88 mg/kg/day, due to variations in application rates.

At the time of the PD 1, an available study on rats showed apparent hydrocephalus and hydronephrosis at all dose levels. There were, however, no data available to estimate the dermal penetration of TPTH. Since dermal exposure was the greatest single source of exposure to workers, this was an important parameter in the resulting risk. Due to the lack of dermal absorption data, the Agency calculated the risk to workers from TPTH by assuming that 100 percent of TPTH would be absorbed. Potential exposure of pesticide applicators to TPTH occurred at a level that was known to produce developmental effects in laboratory animals, thereby resulting in a highly significant developmental risk for pregnant women.

B. Label, Packaging, and Use Changes

The TPTH Task Force has voluntarily implemented measures that have reduced worker exposure to TPTH. These actions include deleting certain crops, such as carrots and peanuts [Ref. 19], requiring the use of closed cab tractors for TPTH applications and additional protective clothing. The Task Force also adopted water soluble packaging to reduce worker exposure to their wettable powder formulation, and added protective clothing requirements to product labels. The flowable concentrate formulation must be used with a mechanical transfer or closed loading system, with workers required to wear a coverall over long sleeve shirt and long pants, chemical-resistant gloves, chemical-resistant apron (when mixing, loading or cleaning), and a respirator. For workers using the wettable powder in water soluble packaging; coveralls, long-sleeve shirt, long pants, chemical-resistant gloves and a dust/mist respirator are required. To apply TPTH by airblast, applicators must wear long-sleeve shirts, long pants, shoes and socks (no gloves are required, since enclosed cabs are necessary to apply TPTH). Flaggers must also be in enclosed cabs. The current risk assessment for TPTH incorporates data submitted since the initiation of the special review as well as the risk mitigation measures put into place since 1985.

C. Refined Data

EPA required that the registrants conduct a rabbit developmental toxicity study to allow a direct determination of maternal and developmental toxicity via the dermal route. This technique provides a direct, more accurate estimate of dermal toxicity than extrapolating from the rabbit oral study to dermal exposure. In addition, the TPTH Task Force generated exposure data for pecan harvesters as no such data were available for this unusual exposure scenario (pecan harvesting involves shaking trees, sweeping pecans into rows under the trees (windrowing), and collecting pecans). The current assessment also reflects the revised Q_1* for cancer risk assessment, updated TPTH dermal absorption/penetration factor, a revised TPTH flowable concentrate exposure assessment, and monitoring data for workers mixing/loading the TPTH wettable powder in a water soluble pack formulation and harvesters re-entering pecan groves after TPTH treatment.

D. Occupational Handler Exposure Estimates

Exposures to workers mixing, loading and applying TPTH were assessed as part of the RED. Risks to flaggers were also assessed. Assessments incorporating current label conditions were conducted for both liquid and wettable powder formulations, as well as for the different application methods (ground, aerial, and chemigation) for each of the three use sites [Refs. 2 and 20].

Dermal exposure is the most significant route of exposure for TPTH. However, the Agency also assessed the potential for inhalation exposure because although inhalation is a very minor route of exposure for workers applying TPTH, subchronic inhalation studies have resulted in lung injury and death to test animals at extremely low doses. The current exposure assessment is based on data from the Pesticide Handlers Exposure Database (PHED) Version 1.1 as well as chemical-specific data from monitoring studies for mixing/loading TPTH wettable powder in a water soluble pack formulation for application to pecan groves and applying TPTH to pecans using an enclosed-cab airblast sprayer [Ref. 21]. Assumptions for the exposure assessment included:

- An average body weight of 70 kg for an adult handler was used in the inhalation and cancer assessments. A body weight of 60 kg was used in the short- and intermediate-term dermal assessments (the typical weight for a woman since the NOAEL is based on a developmental study with developmental toxicity an endpoint of concern).
- The average workday interval is 8 hours per day (e.g., the acres treated or volume of spray solution prepared in a typical day).
- The Agency assumed typical acres treated per workday as follows: 40 acres for airblast application to pecan orchards, 150 acres for groundboom application to potatoes and sugar beets, 1,000 acres for aerial application to potatoes and sugar beets, and 400 acres for aerial application to pecan orchards (this is rarely done). Since specific data were not available for private growers using chemigation for potatoes, or for flaggers during aerial application, a default estimate of 350 acres representing the Exposure Science Advisory Counsel estimate for aerial and chemigation applications in agricultural settings was used. Although a typical aerial application of TPTH involves treatment of 1,000 acres, the Agency assumed that an automated means of flagging, rather than human flaggers would be employed for applications to greater than 350 acres.
- For the non-cancer assessment, the Agency used the maximum application rates for each crop.
- For the cancer assessment, the Agency used typical application rates, typical number of acres treated per day, typical number of applications per year, and assumed a worker life span of 70 years with a TPTH exposure period of over 35 years, and that workers were exposed for 8 hours per day for the

typical number of days applied per year (this varied from 1–96 days depending on type of equipment used and whether applicators were private or commercial applicators).

• The following generic protection factors (PF) were used to represent various risk mitigation measures on the labels: 50 percent PF for body exposure with a double layer of clothing, 90 percent PF for hand exposure for use of chemical resistance gloves, and 80 percent PF for use of dust/mist mask for respiratory protection.

• A dermal absorption factor of 10% was used for the cancer assessment based on the comparison of the LOAELs of the oral and dermal developmental toxicity studies in rabbits [Refs. 3 and 22].

E. Occupational Handler Risk Characterization

Because different toxic effects were selected for the assessment of non-cancer dermal and inhalation risks, separate risk assessments were conducted for dermal and inhalation exposures. Both short- and intermediate-term Margins of Exposure (MOEs) for occupational handlers were derived based upon comparison of dermal exposure estimates against a NOAEL of 3 mg/kg/day from a dermal developmental study in the rabbit. Inhalation MOEs were derived based upon comparison of inhalation exposure estimates against a NOAEL of 0.00034 mg/L or 0.092 mg/kg/day. The cancer assessment used the oral Q_1* of 1.83 $(mg/kg/day)^{-1}$ based on fatal pituitary gland adenoma tumors in female rats. To calculate exposure for the cancer assessment, a 10 percent dermal absorption (based on comparison between rabbit oral and dermal studies) was used, while inhalation absorption was assumed to be 100 percent. The dermal and inhalation exposures were summed to calculate a total exposure, which was combined with the Q_1* to estimate cancer risk [Ref. 17].

1. *Non-cancer risk assessment*. The non-cancer occupational risk estimates are summarized in the following Table 2. Since the uncertainty factors and target MOEs for occupational workers are 100 for short- and intermediate-term dermal and inhalation risk, MOEs over 100 represent acceptable occupational risks to workers, whereas MOEs below 100 would represent a risk concern for the Agency. Non-cancer inhalation risks were acceptable across all use scenarios. Dermal non-cancer risks were also acceptable across all use scenarios, when mitigation measures were considered, with the exception of mixing and loading liquids for aerial application to sugar beets at maximum application rates (MOE of 84) and mixing and loading wettable powder in water-soluble bags for aerial and chemigation application for all three use sites (MOEs of 33 to 82).

TABLE 2.— SUMMARY OF OCCUPATIONAL HANDLER DERMAL AND INHALATION NON-CANCER RISK ESTIMATES

Exposure Scenario	Crop	Application Rate (lb ai/A)	Dermal Short- and Intermediate-Term (MOE = 100)			Inhalation (MOE = 100)		
			Baseline	PPE	Engineering Controls	Baseline	PPE	Engineering Controls
Mixer/Loader Risk.								
Mixing/Loading Liquids for Aerial/Chemigation Application.	Pecans	0.375	See Eng. Control	See Eng. Control	140	See Eng. Control	See Eng. Control	520
	Potatoes	0.1875	See Eng. Control	See Eng. Control	110	See Eng. Control	See Eng. Control	410
	Sugar beets	0.25	See Eng. Control	See Eng. Control	84	See Eng. Control	See Eng. Control	310
	Sugar beets	0.125 (Typ)	See Eng. Control	See Eng. Control	170	See Eng. Control	See Eng. Control	N/A[2]
Mixing/Loading Liquids for Groundboom Application.	Potatoes	0.1875	See Eng. Control	See Eng. Control	740	See Eng. Control	See Eng. Control	2,800
	Sugar beets	0.25	See Eng. Control	See Eng. Control	560	See Eng. Control	See Eng. Control	2,100
Mixing/Loading Liquid for Orchard Airblast Sprayer Application.	Pecans	0.375	See Eng. Control	See Eng. Control	1400	See Eng. Control	See Eng. Control	5,200
Mixing/Loading Wettable Powder (WSB) for Aerial/Chemigation Application.	Pecans	0.375	See Eng. Control	See Eng. Control	55	See Eng. Control	See Eng. Control	600
	Pecans	0.25 (Typ)	See Eng. Control	See Eng. Control	82	See Eng. Control	See Eng. Control	N/A[2]
	Potatoes	0.1875	See Eng. Control	See Eng. Control	44	See Eng. Control	See Eng. Control	480

TABLE 2.— SUMMARY OF OCCUPATIONAL HANDLER DERMAL AND INHALATION NON-CANCER RISK ESTIMATES—Continued

Exposure Scenario	Crop	Application Rate (lb ai/A)	Dermal Short- and Intermediate-Term (MOE = 100)			Inhalation (MOE = 100)		
			Baseline	PPE	Engineering Controls	Baseline	PPE	Engineering Controls
	Potatoes	0.125 (Typ)	See Eng. Control	See Eng. Control	65	See Eng. Control	See Eng. Control	N/A[2]
	Sugar beets	0.25	See Eng. Control	See Eng. Control	33	See Eng. Control	See Eng. Control	360
	Sugar beets	0.125 (Typ)	See Eng. Control	See Eng. Control	65	See Eng. Control	See Eng. Control	N/A[2]
Mixing/Loading Wettable Powder (WSB) for Groundboom Application.	Potatoes	0.1875	See Eng. Control	See Eng. Control	290	See Eng. Control	See Eng. Control	3,200
	Sugar beets	0.25	See Eng. Control	See Eng. Control	220	See Eng. Control	See Eng. Control	2,400
Mixing/Loading Wettable Powder for Orchard Airblast Sprayer Application.	Pecans	0.375	See Eng. Control	See Eng. Control	550	See Eng. Control	See Eng. Control	6,000
Applicator Risk.								
Applying Sprays with a Fixed-Wing Aircraft.	Pecans	0.375	No Data, See Eng. Cont.	No Data, See Eng. Cont.	240	No Data, See Eng. Cont.	No Data, See Eng. Cont.	630
	Potatoes	0.1875	No Data, See Eng. Cont.	No Data, See Eng. Cont.	190	No Data, See Eng. Cont.	No Data, See Eng. Cont.	510
	Sugar beets	0.25	No Data, See Eng. Cont.	No Data, See Eng. Cont.	140	No Data, See Eng. Cont.	No Data, See Eng. Cont.	380
Applying Sprays with a Groundboom Sprayer.	Potatoes	0.1875	460	580	1,300	310	1,500	5,300
	Sugar beets	0.25	340	440	960	230	1,100	4,000
Applying Sprays to Orchards with an Airblast Sprayer.	Pecans	0.375	33	55	630	95	480	950
	Pecans	0.25 (Typ)	50	82	950	140	720	1,400
Mixer/Loader/Applicator Risk.								
Mixing/Loading Liquids and Applying Sprays with a Groundboom Sprayer.	Potatoes	0.1875	N/A[1]	N/A[1]	470	N/A[1]	N/A[1]	1,800
	Sugar beets	0.25	N/A[1]	N/A[1]	350	N/A[1]	N/A[1]	1,400
Mixing/Loading Liquids and Applying Sprays to Orchards with an Airblast Sprayer.	Pecans	0.375	N/A[1]	N/A[1]	430	N/A[1]	N/A[1]	810
Mixing/Loading Wettable Powder (WSB) and Applying Sprays with a Groundboom Sprayer.	Potatoes	0.1875	N/A[1]	N/A[1]	240	N/A[1]	N/A[1]	2,000

TABLE 2.— SUMMARY OF OCCUPATIONAL HANDLER DERMAL AND INHALATION NON-CANCER RISK ESTIMATES—Continued

Exposure Scenario	Crop	Application Rate (lb ai/A)	Dermal Short- and Intermediate-Term (MOE = 100)			Inhalation (MOE = 100)		
			Baseline	PPE	Engineering Controls	Baseline	PPE	Engineering Controls
	Sugar beets	0.25	N/A[1]	N/A[1]	180	N/A[1]	N/A[1]	1,500
Mixing/Loading Wettable Powder (WSB) and Applying Sprays to Orchards with an Air-blast Sprayer.	Pecans	0.375	N/A[1]	N/A[1]	290	N/A[1]	N/A[1]	820
Flagger Risk. Flagging Spray Applications.	Pecans	0.375	120	140	6,200	140	700	7,000
	Potatoes	0.1875	250	270	12,000	280	1,400	14,000
	Sugar beets	0.25	190	210	9,400	210	1,100	11,000

[1] There is no unit exposure for mixer/loader to add to the applying unit exposure until engineering controls.
[2] Inhalation MOE is not of concern at the maximum application rate; therefore, an assessment of the typical application was not necessary.
[a] Note: Baseline unit exposure represents long pants, long sleeved shirt, no gloves, open cab tractor, and no respirator. Additional PPE includes double layer of clothing (50% protection factor for clothing), chemical resistant gloves, and a dust/mist respirator. Engineering controls include closed mixing/loading or water-soluble bag, single layer clothing, chemical resistant gloves, enclosed cab, enclosed cockpit, or enclosed truck (98% protection factor). Application rates are based on the maximum application rates listed on the TPTH labels, and on typical application rates reported by BEAD. Acres treated per day are from BEAD reports of the acres treated in one work day.
[b] Source: TPTH: HED Revised Risk Assessment for the Reregistration Eligibility Decision (RED) Document, September 21, 1999.

Although the MOEs for mixing/loading wettable powder for aerial/chemigation application were calculated to be less than 100, based on a number of factors, the Agency determined in its reregistration eligibility determination that the MOEs for the water soluble bag formulation are acceptable. First, the results of the Agency's non-cancer occupation risk assessment for this formulation (and similar results in the occupational cancer risk assessment discussed below), are not consistent with the Agency's experience that water soluble packaging results in exposures comparable to the use of other engineering controls such as closed mixing/loading systems for liquid formulations, and is therefore a protective measure that the Agency generally promotes. Second, the Agency believes that the significant discrepancy observed between exposure from liquid formulations in closed systems and water soluble bags for this chemical are due to the failure of the TPTH water soluble bag study to replicate actual use patterns on all three registered crop sites i.e., the study monitored workers who handled only enough active ingredient to treat 5 acres, modeling an airblast application scenario for pecan orchards which are 40 acres, rather than the 1,000 acres for aerial application to sugar beets and potatoes.

Results of the worker exposure study were thus, of necessity, extrapolated to calculate risks from handling enough active ingredient to evaluate larger acreages. However, the Agency does not believe, under the circumstances present, that a linear extrapolation of exposure from 5 acres to 1,000 acres is reliable. Consequently, while the Agency believes that the study is appropriate to estimate exposures based on treatment of 40 acres (i.e., airblast application on pecan orchards), it does not believe that it is appropriate to use this same study to estimate exposures based on treatment of 1,000 acres, and that use of this study provides an overestimate of risk. Based on the Agency's experience that water soluble packaging results in exposures comparable to the use of other engineering controls such as closed mixing/loading systems for liquid formulations, the Agency determined in the RED that a new exposure study based on a larger treated acreage, which was required with the issuance of the RED, will demonstrate that the MOEs for the water soluble bag formulation are acceptable.

2. *Cancer risk assessment*. The occupational cancer risk estimates are summarized in Table 3 below. Under the Agency's non-dietary cancer risk policy, cancer risks less than 1.0×10^{-6} (i.e., less than a 1 in 1 million lifetime risk of excess cancer from TPTH exposure) are generally considered acceptable, cancer risks greater than 1×10^{-4} (i.e., more than a 1 in 10,000 lifetime risk of excess cancer from TPTH exposure) are generally considered unacceptable, whereas for cancer risks that fall between 1×10^{-6} and 1×10^{-4}, the Agency's goal is to bring these risks to 10^{-6} or less through mitigation if feasible, although risks higher than 10^{-6} but less than 10^{-4} will generally be considered acceptable if measures to mitigate these risks are not available and benefits of continuing use are demonstrated. Mixing and loading wettable powder in water-soluble bags for aerial/chemigation and for groundboom application on potatoes was estimated at 1.5×10^{-4} for commercial applicators. As noted above in Unit IV.E.1., the Agency believes that the deficiencies in the exposure study used to model this formulation provide an overestimate of exposure and risk for potatoes and sugarbeets. Most of the other cancer risk estimates were greater than 1×10^{-6} but less than 1.0×10^{-4} (ranging from 1.1×10^{-6} to 9.1×10^{-5}).

TABLE 3.— SUMMARY OF OCCUPATIONAL HANDLER CANCER RISK ESTIMATE FOR TPTH

Exposure Scenario	Crop	Application Rate (lb ai/A)	Cancer Risk Estimate		
			Baseline	PPE	Engineering Controls
Mixer/Loader Risk. Mixing/Loading Liquids for Aerial/Chemigation Application.	Pecans	0.25	See Eng. Control	See Eng. Control	3.4E-6
	Potatoes	0.125	See Eng. Control	See Eng. Control	6.3E-5 / 1.5E-6
	Sugar beets	0.125	See Eng. Control	See Eng. Control	3.8E-5
Mixing/Loading Liquids for Groundboom Application.	Potatoes	0.125	See Eng. Control	See Eng. Control	6.1E-5 / 1.9E-6
	Sugar beets	0.125	See Eng. Control	See Eng. Control	3.7E-5 / 1.9E-6
Mixing/Loading Liquid for Orchard Airblast Sprayer Application	Pecans	0.25	See Eng. Control	See Eng. Control	1.0E-6
Mixing/Loading Wettable Powder (WSB) for Aerial/Chemigation Application.	Pecans	0.25	No Data Cont.	No Data Cont.	8.1E-6
	Potatoes	0.125	No Data Cont.	No Data Cont.	1.5E-4 / 3.6E-6
	Sugar beets	0.125	See Eng. Control	See Eng. Control	9.1E-5
Mixing/Loading Wettable Powder (WSB) for Groundboom Application	Potatoes	0.125	See Eng. Control	See Eng. Control	1.5E-4 / 4.6E-6
	Sugar beets	0.125	See Eng. Control	See Eng. Control	8.8E-5 / 4.6E-6
Mixing/Loading Wettable Powder (WSB) for Orchard Airblast Sprayer Application.	Pecans	0.25	See Eng. Control	See Eng. Control	2.4E-6
Applicator Risk. Applying Sprays with a Fixed-Wing Aircraft.	Pecans	0.25	No Data, See Eng. Cont.	No Data, See Eng. Cont.	2.0E-6
	Potatoes	0.125	No Data, See Eng. Cont.	No Data, See Eng. Cont.	3.8E-5
	Sugar beets	0.125	No Data, See Eng. Cont.	No Data, See Eng. Cont.	2.3E-5
Applying Sprays with a Groundboom Sprayer	Potatoes	0.125	1.4E-4 / 4.3E-6	8.1E-5 / 2.5E-6	3.5E-5 / 1.1E-6
	Sugar beets	0.125	8.3E-5 / 4.3E-6	4.9E-5 / 2.5E-6	2.1E-5 / 1.1E-6
Applying Sprays to Orchards with an Airblast Sprayer.	Pecans	0.25	4.4E-5	2.5E-5	2.5E-6
Mixer/Loader/Applicator Risk. Mixing/Loading Liquids and Applying Sprays with a Groundboom Sprayer.	Potatoes	0.125	N/A	N/A	3.0E-6
	Sugar beets	0.125	N/A	N/A	3.0E-6
Mixing/Loading Liquids and Applying Sprays to Orchards with an Airblast Sprayer.	Pecans	0.25	N/A	N/A	3.5E-6

TABLE 3.— SUMMARY OF OCCUPATIONAL HANDLER CANCER RISK ESTIMATE FOR TPTH—Continued

Exposure Scenario	Crop	Application Rate (lb ai/A)	Cancer Risk Estimate		
			Baseline	PPE	Engineering Controls
Mixing/Loading Wettable Powder (WSB) and Applying Sprays with a Groundboom Sprayer.	Potatoes	0.125	N/A	N/A	5.7E-6
	Sugar beets	0.125	N/A	N/A	5.7E-6
Mixing/Loading Wettable Powder (WSB) and Applying Sprays to Orchards with an Airblast Sprayer	Pecans	0.25	N/A	N/A	5.0E-6
Flagger Risk.					
Flagging Spray Applications	Pecans	0.25	4.5E-6	3.4E-6	9.1E-8
	Potatoes	0.125	3.4E-5	2.5E-5	6.8E-7
	Sugar beets	0.125	2.0E-5	1.5E-5	4.1E-7

[a]N/A—There is no unit exposure for mixer/loader to add to the applying unit exposure until engineering controls.
[b]Baseline unit exposure represents long pants, long sleeved shirt, no gloves, open cab tractor, and no respirator. Additional PPE includes double layer of clothing (50% protection factor for clothing), chemical resistant gloves, and a dust/mist respirator. Engineering controls include closed mixing/loading or water-soluble bag, single layer clothing, chemical resistant gloves, enclosed cab, enclosed cockpit, or enclosed truck (98% protection factor). Application rates are based on the maximum application rates listed on the TPTH labels, and on typical application rates reported by BEAD. Acres treated per day and number of exposures per year are based on data from BEAD. In cases where the number of acres treated or the number of exposures per year are different for commercial applicator and private grower, both estimates are presented, separated by a "/" in the following manner: commercial value / private grower value.
[c]Source: TPTH: HED Revised Risk Assessment for the Reregistration Eligibility Decision (RED) Document, September 21, 1999.

3. *Incident reports.* The Agency reviewed the OPP Incident Data System (IDS), Poison Control Center, California Department of Food and Agriculture (replaced by the Department of Pesticide Regulation in 1991), and National Pesticide Telecommunications Network (NPTN) databases for reported incident information for TPTH. Only seven cases submitted to the IDS were identified; however, no documentation confirming exposure or health effects were available. As a result, the Agency has concluded that relatively few incidents of illness from exposure to TPTH have been reported and no recommendations can be made based on the few incident reports available [Ref. 2].

F. Post-Application Exposure and Risk Estimates

The Agency determined there were three main categories of activities which could result in the potential postapplication exposures to individuals entering areas treated with TPTH [Ref. 17]:

• Harvesting pecans (although mechanically harvested, it is a very dusty operation); Scouting and moving hand-set irrigation pipes for potatoes and sugar beets; and

• Harvesting, sorting/packing, and brushing/washing potatoes and sugar beets.

None of these crop activities have been identified as scenarios yielding potential chronic exposure (i.e., ≥ 180 days of exposure/year) concern.

The postapplication exposure assessment for pecan harvesting was based on a reentry study of pecan workers operating windrowing equipment as part of pecan harvesting activities [Ref. 23]. Both dermal and inhalation exposure monitoring were conducted. In addition, soil and thatch samples were collected from the dripline beneath the treated pecan trees (potential TPTH postapplication exposures were expected from both the pecans and disturbances of the soil under trees). Both the monitoring data, as well as the soil/thatch residue levels, were used in the assessment.

Soil and foliar dissipation data that were collected following applications of TPTH to potatoes and peanuts [Ref. 24] were also used for the postapplication exposure assessment for potatoes and sugar beets (since potatoes and sugar beets both have similar application rates and cultural techniques). TPTH did not appear to dissipate in the soil; therefore, the highest daily mean level (1.36 parts per billion TPTH) at one day post application was used in the assessment. The soil level was used in conjunction with a soil/dermal transfer coefficient of 3.9 ng/ppb/hr. The foliar dissipation curve is (log Y = -0.0573X + -0.498), from the TPTH foliar dissipation study accepted by EPA in 1986 (Y = the dislodgeable foliar residue in μg/cm^2 and X = the number of days after the application).

The assumptions used in the calculations for occupational postapplication risks include the following:

• Application rates used for the different postapplication scenarios were:

No rate required for pecan harvesting since the study provided exposure values (μg/kg/hr), making calculations based on an application rate not necessary (the study application rate was 0.375 lb ai/acre)

For the harvesting and maintenance activities assessment, the non-cancer calculations were completed using the maximum application rates for specific crops recommended by the available TPTH labels. Typical application rates were used in the calculations for the cancer assessment.

• Transfer coefficients (Tc) were not used for pecan harvesting estimates because the study provides exposure values (μg/kg/hr). For potato harvesting, a soil/dermal transfer coefficient of 3.9 ng/ppb/hr was used, based on a study conducted by the Medical University of South Carolina for the Agency's Hazard Assessment Project [Ref. 24]. TPTH soil and foliar dissipation data. For maintenance activities associated with potatoes and sugar beets, the transfer coefficient was assumed to be 2,500 cm^2/hr.

• Daily exposure is assumed to occur for 8 hours per day.

• The average body weight of 60 kg is used in the non-cancer risk estimates (due to a developmental endpoint), while for cancer estimates, 70 kg is used, representing a typical adult.

• Exposure frequency is estimated to be 40 days/year for pecan harvesting, and 30 days/year for potato and sugar beet maintenance activities and harvesting.

• Exposure duration is assumed to be 35 years. This represents a typical working lifetime.

• Lifetime is assumed to be 70 years.

• Dermal absorption is assumed to be 10 percent for cancer estimates because the Q_1* is not based on a dermal study, as in the handler assessment.

• The Q_1* used in the cancer assessment is 1.83 $(mg/kg/day)^{-1}$.

G. Occupational Postapplication Risk Characterization

The postapplication risks are summarized in Tables 4–6 below. The postapplication assessment indicates that for pecan harvesting, MOEs exceed 100 on day zero after application, while cancer risk estimates are greater than 1.0 $\times 10^{-4}$ until 7 days after the last application at the Georgia site, and between 21 and 30 days after the last application at the Texas site. However, pecan harvesting generally occurs at least 21 days after TPTH application. As part of the reregistration eligibility decision, TPTH labels have been amended to require a minimum harvest interval of 30 days, thereby resulting in MOEs over 100 and cancer risks of less than 1×10^{-4} for pecan harvesters.

As indicated in Table 5 below, MOEs for maintenance activities are ≥ 100 on day zero after application for potatoes, and on the second day after application for sugar beets. The cancer risk estimate for maintenance activities was found to be less than 1.0×10^{-4} on the second day after application for both potatoes and sugar beets. The MOE and cancer risk estimate for potato harvesting do not exceed the Agency's level of concern on any day after application (see Table 6). Since TPTH has a current REI of 48 hours for all crops, postapplication risks for maintenance and harvesting activities on sugar beets and potatoes are acceptable.

TABLE 4.—SUMMARY OF ESTIMATED POSTAPPLICATION RISK ESTIMATES BASED ON RESIDUE RATIOS DURING PECAN HARVESTING

Days After Last Treatment	Soil/Thatch Residue (µg/g)[a]	Residue Ratio[b]	MOE		Cancer Risk Estimate
			Dermal	Inhalation	
Georgia.					
0	42.9	4.0	170	480	1.9E-04
1	23.3	2.2	320	890	1.1E-04
3	27	2.5	270	770	1.2E-04
7	10.8	1.0	680	1900	4.9E-05
14	11.7	1.1	630	1800	5.3E-05
21	18	1.7	410	1200	8.1E-05
30	18.4	1.7	400	1100	8.3E-05
60	10.7	0.99	690	1900	4.8E-05
90	10.9	1.01	680	1900	4.9E-05
120	3.5	0.32	2100	5900	1.6E-05
Texas.					
0	7.2	1.76	220	1100	1.4E-04
1	7.4	1.80	220	1100	1.5E-04
3	3.8	0.93	420	2100	7.6E-05
7	6.4	1.56	250	1200	1.3E-04
14	9.2	2.24	170	850	1.8E-04
21	6.2	1.51	260	1300	1.2E-04
30	4.2	1.02	380	1900	8.4E-05
60	4.0	0.98	400	2000	8.0E-05
90	3.1	0.76	520	2500	6.2E-05
120	4.8	1.17	330	1600	9.6E-05

[a] Soil/thatch residues from pecan harvester exposure study (MRID #43557401).
[b] Residue ratios calculated by dividing the residue level on a given day by the residue level on the day exposure samples were collected (assumed to be 10.8 µg/g for GA and 4.1 µg/g for TX).

TABLE 5.— SUMMARY OF POSTAPPLICATION RISK ESTIMATES FROM TPTH DURING MAINTENANCE ACTIVITIES

Days After Last Treatment	Potatoes Non-cancer [a] (App. Rate: 0.1875 lb ai/A)		Sugar beets Non-cancer[a] (App. Rate: 0.25 lb ai/A)		Potatoes and Sugar beets Cancer[a] (App. Rate: 0.125 lb ai/A)	
	DFR[b] (µg/cm²)	MOE	DFR[b] (µg/cm²)	MOE	DFR[b](µg/cm²)	Cancer Risk Estimate
0	0.084	100	0.112	80	0.056	1.2E-04
1	0.074	120	0.099	91	0.049	1.1E-04
2	0.065	140	0.087	100	0.043	9.3E-05

[a] The maximum application rates (0.1875 lb ai/A and 0.25 lb ai/A) were used for non-cancer assessment of potatoes and sugar beets, respectively. The typical application rate (0.125 lb ai/A) for both potatoes and sugar beets was used to estimate cancer risk.
[b] Dislodgeable foliar residue. Based on regression equation from study (MRID# 42507801) and using application rate indicated above, initial DFR of 4%, and a dissipation rate of 12% per day.

TABLE 6.— SUMMARY OF POSTAPPLICATION RISK ESTIMATES FROM TPTH DURING POTATO HARVESTING

Days After Last Treatment[a]	Non-cancer		Cancer	
	TR[b] (ppb TPTH)	MOE	TR[b] (ppb TPTH)	Cancer Risk
Any Day	1.36	4,300,000	1.36	4.5E-9

[a] TPTH was not found to dissipate appreciably in soil; therefore, the above risks are applicable for any day after treatment.
[b] The transferrable residue was based on the highest daily average residue measured.

V. Summary of Benefits and Evaluation of Alternatives

A. Importance of Triphenyltin Hydroxide

The Agency conducted a benefits assessment for TPTH by analyzing the economic impact of cancellation on each of the three registered use sites. Of the three sites for which TPTH is registered (pecans, potatoes and sugarbeets), moderate economic impacts to pecan production are anticipated if TPTH is not available for disease control. The impact will be due to higher prices for the alternatives rather than their reduced efficacy. More importantly, however, there is potential for development of resistance from the use of the registered alternatives which, as part of the triazole group of fungicides, share a single site and similar mode of action, thereby increasing the risk of resistance development over time in the absence of TPTH, which has a different mode of action from the triazoles. For potatoes and sugarbeets, minor economic impacts would result from TPTH cancellation, although the cancellation of TPTH could adversely affect resistance management programs relying on TPTH as an inexpensive contact fungicide with a multi-site mode of action. Sugarbeet growers would also apply greater amounts of an alternative fungicide (e.g. mancozeb), if TPTH were not available, resulting in a negative impact on sugarbeet integrated pest management (IPM) programs and greater overall environmental pesticide loading.

B. Usage of Triphenyltin Hydroxide

As already noted, TPTH is a non-systemic protectant foliar fungicide registered for use on three sites: pecans, potatoes and sugarbeets. The fungicide was also formerly registered for use on carrots, peanuts and tobacco, and as an industrial preservative for vinyl (PVC) electrical tubing. The exact mode of action of TPTH is not clearly understood. Researchers indicate that TPTH inhibits oxidative phosphorylation in fungal pathogens. The fungicide's inhibition of other metabolic pathways has also been proposed [Ref. 25]. In addition to disease control, TPTH is registered as a suppressant of Colorado potato beetle populations on potatoes. The mode of action of TPTH against the Colorado potato beetle has not been identified.

TPTH use is limited to some extent by its phytotoxicity. The TPTH label recommends that the fungicide not be applied in combination with surfactants, spreaders, stickers or buffers to reduce the possibility of phytotoxicity. A phytotoxic response occurs when applied alone at the full label rate on potatoes [Ref. 26].

The Agency estimates total usage of TPTH in the United States at approximately 569,000 pounds of active ingredient per year [Ref. 27]. Pecans and sugarbeets represent the largest volume of use and highest percent crop treated of the three use sites [Ref. 27].

1. *Pecans*. TPTH is principally used to control scab, *Cladosporium effusum*, the most important disease on pecans [Refs. 27 and 28]. TPTH applications begin when leaves are unfolding and continue at 2 to 4 week intervals until the shucks begin to open. A maximum of 10 applications may be made per growing season, although the total amount of TPTH which can be used in a given season is limited to 1.5 lbs active ingredient per acre (ai/A) in Arizona and New Mexico, and all areas west of Interstate 35 (I-35), and 2.25 lbs ai/A in all other areas east of I-35. The difference in maximum seasonal application rates is based on differences in climate which make disease pressures greater in some areas relative to others [Ref. 2]. Scab infection occurs on both foliage and nuts leading to lesion formation on nuts and subsequent nut drop.

In addition to scab, TPTH is registered to control other diseases on pecans including: brown leaf spot (*Cercospora fusca*), downy spot (*Mycosphaerella caryigena*), liver spot (*Gnomonia nerviseda*), powdery mildew (*Microsphaera alni*), sooty mold (causal agent not identified) and leaf blotch (*Mycosphaerella dendroides*).

2. *Potatoes*. TPTH is used for control of early blight, *Alternaria solani*, and late blight, *Phytophthora infestans*, of potatoes, primarily in the upper Midwest potato growing region. The major states where TPTH is used on potatoes include Minnesota, North Dakota, Wisconsin and Colorado. Fungicide applications typically begin when plant disease symptoms are first observed and continue as needed. Due to phytotoxic concerns with applications of the fungicide at the full label rate of 0.19 lbs ai/A, TPTH is applied at 0.09 lbs ai/A in combination with another fungicide, typically mancozeb at 1 lb a.i./A. Two to three TPTH/mancozeb applications are usually made per growing season [Ref. 27]. A maximum of 0.56 lbs ai/A of TPTH can be applied in a given season (or the equivalent of three applications at the maximum labeled use rate).

TPTH plays a role in potato IPM programs in the upper Midwest. University plant pathologists have developed IPM programs incorporating the use of TPTH, thereby allowing growers to reduce the total amount and number of fungicide applications to potatoes per growing season.

TPTH is also registered as a suppressant of Colorado potato beetle (CPB) populations. Research by Hare, Logan and Wright [Ref. 29] indicated that applications of TPTH reduced CPB larval densities. The researchers concluded that applications of TPTH may enable potato growers to reduce the total number of insecticides necessary for control of CPB. However, applying TPTH at the rate reported to suppress CPB may not be acceptable due to applications of the fungicide resulting in a phytotoxic response to many commercially desirable varieties. Thus, the Agency does not consider TPTH to be a viable pest control option for control of CPB.

3. *Sugarbeets*. TPTH is used in North Dakota, Minnesota and West Texas to control Cercospora leaf spot, *Cercospora beticola*, on sugarbeets [Ref. 30]. If the disease is not adequately controlled, fungal infection results in defoliation and subsequent yield losses.

TPTH applications begin when environmental conditions conducive for Cercospora leafspot infection appear or when infection is first observed.

Growers typically apply up to four TPTH applications with the rate varying between the maximum and minimum labeled rate [Ref. 31]. The current maximum labeled seasonal use rate is 0.5 lbs ai/A in all states (or two applications at the maximum labeled use rate) except Minnesota, North Dakota, and Michigan, where the maximum seasonal use allowed is 0.75 lbs ai/A (or three applications at the maximum labeled use rate). Use of TPTH at the highest labeled rate has been necessary in some states in recent years due to TPTH tolerance.

C. Alternatives Assessment

1. *Pecans*. Several potential alternative fungicides are registered for pecans including: azoxystrobin, benomyl, copper compounds, dodine, fenarimol, fenbuconazole, propaconazole, sulfur, thiophanate methyl, and ziram. TPTH is a protectant fungicide having a multi-site mode of action which controls all dominant fungal diseases (such as scab, downy spot, brown leaf spot, powdery mildew, liver spot, and leaf blotch) of pecans. No alternative fungicide is claimed to control all of the diseases listed on labels as being controlled by TPTH [Ref. 32].

Published data were not available for the Agency to determine the efficacy of TPTH compared to registered alternatives for control of scab. Due to this lack of data, the Agency spoke with experts familiar with scab to determine pecan yield impacts without the use of TPTH. Based on expert input, it appears that pecan diseases can be controlled using registered alternatives, but production costs will increase. The experts also claimed that the pecan growers are already on the verge of bankruptcy, and if the production costs were to increase, then many small pecan growers may be forced out of business. All experts believed that in the absence of TPTH, propaconazole and fenbuconazole would be used for scab control. In the southern states, pecans are sprayed approximately 6–8 times per year with different fungicides (mostly TPTH, propaconazole and fenbuconazole). The researchers estimated that replacing TPTH with propaconazole and fenbuconazole will not impact the yield but pecan production costs will be increased due to higher fungicide costs. In addition, since propaconazole and fenbuconazole belong to the triazole group of fungicides, their extensive use may result in pest resistance due to their similar modes of action [Ref. 27].

During 1999, azoxystrobin was also registered for use on pecan against scab. Azoxystrobin is very effective in controlling scab and possibly other diseases but growers may not use it extensively due to its higher cost per acre. The rest of the registered alternative fungicides appear to have limited viability for the control of pecan diseases. The scab pathogen has developed resistance against benomyl and thiophanate-methyl. Applications of dodine result in a phytotoxic response by several pecan varieties [Refs. 33 and 34]. Some states suggest that the use of dodine be restricted to certain varieties or be used only during the pre-pollination period [Ref. 35]. Applications of copper or sulfur may result in a phytotoxic response by pecan foliage at high temperatures. No data are available to determine the efficacy of fenarimol for control of scab. Based on a communication with a university plant pathologist, fenarimol is less efficacious than TPTH [Ref. 30].

Cultural controls are practiced to reduce scab infection. These include pruning the tree for better air circulation and the use of resistant varieties [Refs. 36, 37 and 38]. However, these non-chemical controls alone cannot provide acceptable control of scab.

2. *Potatoes*. TPTH is registered for control of early blight, Alternaria solani, and late blight, *Phytophthora infestans*. Registered alternative fungicides to TPTH for control of early and/or late blight include those that are protective (chlorothalonil, copper compounds, metalaxyl, and the ethylene bisdithiocarbamates (EBDCs), such as mancozeb, maneb, and metiram) and those with protective, systemic and curative properties (azoxystrobin, cymoxanil, dimethemorph, metalaxyl).

Growers use TPTH in the late season to control pathogen sporulation to prevent tuber blight phase of the disease. Recently registered fungicides (azoxystrobin, dimethemorph, and cymoxanil) also have antisporulation activity against the late blight pathogen. However, TPTH is preferred due to its lower per acre treatment costs, reasonable efficacy and because it has a different mode of action than the other registered alternatives, diminishing the likelihood of resistance development [Refs. 27 and 32].

Chlorothalonil, mancozeb and azoxystrobin are also effective in controlling early blight disease on potatoes. Based on three field studies, EPA concluded that combinations of TPTH/mancozeb fungicide applications provide either equal or greater efficacy than any other fungicide application for control of early blight [Refs. 39, 40 and 41]. However, a statistical analysis of the data indicates that there were no significant differences when comparing mancozeb/TPTH to mancozeb treatments in terms of yield. Thus, the Agency believes that if TPTH were not available, growers could use mancozeb at 0.80 to 1.60 lbs ai/A without any decrease in efficacy in the upper Midwest potato growing region. Other secondary alternatives (chlorothalonil, maneb and metiram) could also be used without any decrease in efficacy. The Agency is aware that the unavailability of TPTH might affect potato IPM programs. This may result in growers applying greater amounts of other fungicides (chlorothalonil and EBDCs) during the potato growing season than if TPTH use were allowed to continue.

Cultural controls are practiced to reduce fungal infection. These include: (1) Planting tolerant and/or resistant varieties and (2) supplying adequate fertilizer and water to maintain plant vigor and reduced susceptibility to fungal infection [Ref. 42]. However, fungicides are still needed for acceptable disease control.

3. *Sugarbeets*. The most viable alternatives to TPTH are tetraconazole (currently only available under an emergency exemption) and mancozeb. If TPTH were no longer registered there could be two possible scenarios: (1) Mancozeb and tetraconazole (under an emergency exemption or full registration) are available, and (2) mancozeb alone is available. If mancozeb and tetraconazole are available, sugarbeet growers will use them in alternation to achieve a comparable disease control [Ref. 43]. Tetraconazole is a locally systemic fungicide and is more efficacious than TPTH or mancozeb in controlling the pest. Using a combination of tetraconazole and mancozeb, the growers are not likely to suffer any yield loss. The Agency is currently reviewing an application for registration of tetraconazole, which could be granted within the coming year. start

If both TPTH and tetraconazole were not available, then the growers would have no choice but to use mancozeb alone. Based on two comparative performance studies the Agency estimates sugarbeet growers would most likely use mancozeb without a decrease in efficacy if the spraying frequencies are doubled [Ref. 44]. The Agency estimates that seven mancozeb applications would be needed compared to a total of four with TPTH. This increased number of applications and the higher application rate of using EBDC fungicides would lead to an increase in the pesticide load on sugarbeets of about 10 lbs a.i./A, resulting in a negative impact on sugarbeet IPM programs. Exclusive reliance on a single fungicide could also result in resistance development and impede the ability of farmers to manage resistance through use of multiple fungicides with different modes of action [Ref. 32].

Other registered fungicides on sugarbeets include benomyl, thiophanate-methyl and thiabendazole, and copper compounds. These fungicide are not considered viable alternatives due to the development of Cercospora leafspot isolates resistant to these fungicides [Ref. 45]. Cercospora leafspot resistance to TPTH has not occurred in the United States but has been reported in Greece where there has been extensive and exclusive use of the fungicide on sugarbeets [Ref. 25].

Cultural practices can mitigate disease incidence, but none of the practices can provide commercially acceptable control without the use of fungicides. These non-chemical control practices include the planting of resistant varieties and long crop rotations [Ref. 36].

VI. Agency Evaluations of Comments to the PD 1

A. Public Comments and Agency Responses to the Toxicological Concerns contained in the PD 1

Although no comments relating to the carcinogenicity or inhalation toxicity were received in response to the PD 1, the Agency did receive a number of comments relating to the toxicity and immunotoxicity of TPTH. A summary of these comments and the Agency's responses follow.

1. *Comment*. The American Civil Liberties Union (ACLU) commented that they take strong exception to any action that merely requires warning labels directed at pregnant or fertile women. In addition, they believe that labeling is not an adequate or appropriate substitute for regulating toxic exposures and does not protect the reproductive health of male workers.

Response. In the Registration Standard, the Agency required several measures designed to minimize risks from exposure to TPTH while additional studies were conducted to clarify the exact nature of the developmental effects. To alert female pesticide applicators about the potential for teratogenic effects, a label statement indicating that ''TPTH causes birth defects in laboratory animals and that exposure during pregnancy should be avoided'' was required for all TPTH products. In addition, the Agency imposed additional regulatory requirements including protective clothing which must be worn by all persons handling TPTH (i.e., impermeable gloves, long pants, long-sleeved shirt, hat and boots) and appropriate respiratory protection. Since the Registration Standard was issued, the registrant has voluntarily required closed mixing/loading systems for aerial applications, adoption of mechanical transfer systems for all liquid formulations and packaging of the wettable powder formulation in water soluble packets. These requirements are equally protective of male and female pesticide applicators handling pesticide products containing TPTH. Secondly, the Registration Standard also requires the classification of TPTH as a restricted use pesticide, which provides greater controls to ensure proper pesticide handling and use. The Agency believes that these restrictions will effectively minimize risks to female and male applicators by reducing the potential for exposure.

2. *Comment*. American Hoechst Corporation disagrees with the Agency's position that TPTH produces teratogenic effects and that a NOAEL has not been determined in the two previously reviewed rat teratogenicity studies [Refs. 5 and 46]. American Hoechst and M&T Chemicals had the rat teratology study by Battelle Columbus Laboratories [Ref. 3] peer reviewed by two independent sources and submitted the results of those reviews. One reviewer found that 2.8 mg/kg/day was clearly a NOAEL for teratogenicity while the second reviewer was unable to identify a no effect level from the data available. In addition, American Hoechst submitted the results of a teratology study of triphenyltin fluoride (TPTF) that had been previously submitted to EPA. The NOAEL for this study was 3.0 mg/kg/day.

Response. The submissions from American Hoechst Corporation do not satisfactorily eliminate concerns regarding the teratogenicity of TPTH because no new information was presented to the Agency. Although these studies provided sufficient data to assure that TPTH is not teratogenic in rats at dose levels up to and including 8.0 mg/kg/day, these studies did result in developmental and maternal toxicity. Second, the registrant did not provide new information indicating that a NOAEL exists in the two rat studies. Third, the teratology study with TPTF also indicated hydroureter as a fetal lesion. The initial reviewer of this study classified this compound as a teratogen.

3. *Comment*. American Hoechst Corporation commented that the PD 1 failed to note that guidelines for immunotoxicity have not been established by the Agency. The notice also failed to note two immunotoxicity studies submitted to the Agency in January 1983. The registrants concluded that the first study, conducted with male mice dosed at 2.5 mg/kg/day for 10 days produced no indication of immunosuppressive effect as indicated by a reduction of spleen or thymus weights. The second study was a 14-day subchronic study. They concluded that the immunological status of mice receiving TPTH was not impaired until doses administered were overtly toxic as indicated by loss of body weight or mortality. The NOAEL for immunotoxicity was 5 mg/kg/day.

Response. The Agency acknowledges that guidelines for immunotoxicity testing were not available at the time of the PD 1. EPA reviewed both studies referenced by American Hoescht Corporation in developing the TPTH Registration Standard. In the first study, only a single dose of TPTH was made. The Agency concludes that this study does not adequately determine whether TPTH can affect the thymus. The Agency believes the second study did not demonstrate a definite NOAEL for TPTH. A decrease in spleen weight occurred at the lowest dose tested (2.5 mg/kg/day). The study also showed a consistent increase in response to T-dependent antigen. In addition, decreased leukocyte counts were observed at all dosage levels of TPTH, except at 10 mg/kg/day. Based on the results of these studies, the Agency required additional data in the Registration Standard, which were assessed as part of the TPTH Registration Eligibility Decision.

A single comment relating to the reproductive effects toxicity of TPTH was received in response to the PD 1. A summary of this comment and the Agency's response follows.

Comment. The ACLU also commented that the Agency has not given equal priority to potential testicular effects associated with exposure of males to TPTH.

Response. In the PD 1, the Agency stated its concerns regarding data suggesting that TPTH may produce decreased testicular weights in laboratory animals. As discussed above, Hoechst-Celanese Corporation submitted a rat two-generation reproduction study in which there were no specific effects of TPTH on the actual reproductive performance of the test animals. Based on the results of this study, the Agency's concern regarding adverse reproductive effects has been rebutted by the TPTH registrants.

A single comment relating to the toxicity to non-target organisms of

TPTH was received in response to the PD 1. A summary of this comment and the Agency's response follows.

Comment. One pecan grower noted that grazing cattle in TPTH-treated pecan groves did not adversely affect the cattle or other nontarget organisms.

Response. The registered labels for the use of TPTH on pecans has a restriction against the grazing of livestock in treated areas. Therefore, this practice is in violation of FIFRA. It should also be noted that grazing cattle in treated areas can result in residues in meat and milk, thereby contributing to human dietary exposure and risk.

B. Public Comments and Agency Responses to the Occupational and Residential Exposure Discussion Contained in the PD 1

Comments relating to exposure to TPTH were received in response to the PD 1. A summary of those comments and the Agency's responses follow.

1. *Comment*. There has been some concern from EPA about exposure, but 85 to 90 percent of the spray operations in Georgia are made from an air-conditioned tractor cab or enclosed cab.

Response. The Agency has taken enclosed cabs into account in its revised risk assessment. Since EPA issued the PD 1, all TPTH labels were amended to require closed cab tractors during application to registered crops.

2. *Comment*. It is very rare to find a woman involved in a pecan spray operation.

Response. The Agency is concerned about exposure to men as well as women from exposure to TPTH. In the absence of data, the Agency assumes that TPTH exposure to both male and female workers may potentially result in developmental effects, even though it is not known whether exposure to males results in developmental effects because male animals were not included in the developmental toxicity studies. The Agency believes that this is a reasonable assumption because data are available for other chemicals indicating that adverse developmental effects can occur with males. In addition, the Agency is also concerned about carcinogenicity, inhalation toxicity and immunotoxicity which clearly affected both males and females in the laboratory studies.

3. *Comment*. An aerial applicator noted that mixer/loaders are equipped with rubber gloves, goggles, a respirator, long-sleeved shirts, long pants and boots which essentially eliminates the possibility of dermal contact. In addition, the pilot himself has no exposure due to the fact that he makes each spray pass to the up wind side staying clear of the swath he made in the previous pass.

Response. Several worker exposure studies are available indicating that exposure does occur to workers even with the use of protective clothing and equipment. Even with state-of-the-art protective clothing and equipment, worker exposure to TPTH does occur. With the new mitigation measures in place and reduction in application rates, these exposures are no longer expected to result in unreasonable risk to workers. Aerial applicators are also required to be in enclosed cockpits when applying TPTH. EPA data do not support anecdotal assertions that pilots who make spray passes up wind avoid any pesticide exposure.

4. *Comment*. Aerial applicators apply about 75% of the fungicides to sugarbeets in Minnesota and North Dakota. These applicators are schooled in the safe application of pesticides. All field marking is done automatically and no people are in the field for this purpose during application. Ground boom sprayers are pulled with tractors with closed cabs and in most cases, air conditioned cabs which further reduces applicator exposure.

Response. The Agency has incorporated relevant protective measures, such as use of enclosed cabs and protective clothing in its revised risk assessment.

C. Public Comments and Agency Responses to the Benefits and Evaluation of Alternatives Contained in the PD 1

Over 490 comments to the TPTH PD1 were received and reviewed by the Agency for information useful to the assessment of fungicidal benefits of TPTH applications. Useful information includes that on efficacy, use practices, alternative control measures, economic impact, and extent of usage. The majority of the comments were endorsements of the benefits of TPTH for agricultural production. However, no data were submitted to support the benefits of TPTH in these testimonial comments. Responses to comments providing information on the benefits to TPTH are listed below.

1. *Comment*. Several sugarbeet grower groups commented on the comparative efficacy of mancozeb and TPTH for control of Cercospora leafspot. These groups stated that if TPTH were not available, greater amounts of mancozeb would be needed for disease control.

Response. The Agency agrees that additional mancozeb applications would be needed in the absence of TPTH for control of Cercospora leafspot. This information has been included in the sugarbeet site analysis.

2. *Comment*. The University of Georgia, College of Agriculture, Cooperative Extension Service, submitted information on both chemical and cultural control methods to reduce scab epidemics on pecans. The comment stated that scab is the major pecan disease in the state. Infection results in a decrease in nut weight and quality. The comment also mentioned that TPTH is the material that provides effective control of scab and other minor diseases on pecans. The low cost of the fungicide also makes TPTH a popular fungicide for pecan disease control.

The comment discussed the use of resistant varieties for control of scab. Most of the old resistant varieties found in pecan groves today were introduced because of their resistance to scab. However, the scab fungus has been able to overcome this resistance resulting in an increase in scab infection. The introduction of new pecan varieties does not provide acceptable scab resistance. The development of resistance by the scab fungus to introduced pecan varieties and the limited amount of available pecan germplasm indicate that varietal resistance may not be an acceptable method of control.

The comment also addressed registered alternative fungicides to TPTH, specifically benzimidazole fungicides (benomyl and thiophanate-methyl) and dodine. Applications of dodine result in a phytotoxic response to many pecan varieties. Pecan phytotoxicity to dodine was also addressed by several other comments from both the university and pecan grower community. Scab resistance to benzimidazole fungicides has been reported in several pecan orchards. Pest resistance has resulted in the failure of this class of fungicides to control scab.

Response. The Agency acknowledges the importance of TPTH for control of pecan scab and the lack of comparable chemical and non-chemical methods of scab control. This information was reflected in the pecan site analysis.

3. *Comment*. The North Dakota State University/University of Minnesota Cooperative Extension Service submitted data on the comparative performance of mancozeb and TPTH for control of Cercospora leafspot and subsequent yield effects on sugarbeets. The conclusions presented in the data indicated that TPTH was the most efficacious fungicide for control of Cercospora leafspot compared to EBDCs and an untreated control.

Response. The data provide a trend indicating that TPTH is a more efficacious fungicide in terms of disease severity, total yields and recoverable sugar. However, these differences were not consistently statistically different. Thus, the Agency concludes sugarbeet growers could replace TPTH with mancozeb without facing a significant difference in marketable yields.

VII. Risk/Benefit Analysis

A. Summary of Risk

EPA has evaluated the risk posed by TPTH to workers mixing, loading and applying the pesticide to pecans, sugarbeets and potatoes. Developmental toxicity MOE estimates are greater than 100 for mixer/loaders using the flowable concentrate formulation, with the exception of applications to sugar beets at the maximum application rate with aerial/chemigation application (MOE of 84), based on conservative assumptions and a developmental NOAEL based on the highest dose tested, since no LOAEL was established. MOEs for mixer/loaders for the wettable powder formulation in water soluble bags for aerial/chemigation application are less than 100 (ranging from 33 to 82); however, the Agency believes these MOEs are actually over 100 given deficiencies in the exposure study used to model this formulation (see discussion in Unit IV.E. of this preamble). MOEs for applicators and harvesters are all greater than 100.

The cancer risks to mixer/loaders range from 1.0×10^{-6} to 6.3×10^{-5} for mixing/loading the liquid formulation, and range from 2.4×10^{-6} to 1.5×10^{-4} for mixing/loading the wettable powder formulation in water soluble bags (WSBs). The estimated risk for the wettable powder in WSBs for aerial/chemigation application is considered to be an overestimate of the actual risk (see Unit IV.E. of this preamble). Thus, mixer/loader cancer risks for all use scenarios are believed to be less than 1.0×10^{-4}. Cancer risks for TPTH applicators range from 1.1×10^{-6} to 3.8×10^{-5}. Cancer risks are less than 1.0×10^{-4} after 21 days and for pecan harvesters are less than 1.0×10^{-4} for post-application maintenance activities after 48 hours.

B. Summary of Benefits

If TPTH were unavailable, growers would have to use greater quantities of alternative fungicides. Some of these may not provide as effective control as TPTH. Reliance on available alternatives, without the ability to rotate in TPTH treatments, could also result in an increased likelihood of resistance development. Additional possible disadvantages of using alternative fungicides include phytotoxicity, limited availability due to local restrictions, and higher cost. Unavailability of TPTH could also result in increased use of EBDC fungicides, which are used at shorter intervals than TPTH and at higher rates, resulting in a higher overall volume of pesticide use and environmental loading.

C. Conclusions

Based on its risk and benefits assessment, the Agency has concluded that the risks associated with the use of TPTH in accordance with current label restrictions are not unreasonable. Therefore, benefits provided from the use of TPTH outweigh the risks.

VIII. Agency's Decision Regarding Special Review

EPA has concluded that the risks of TPTH are outweighed by the benefits of continued use. EPA proposes to terminate the Special Review examining the developmental toxicity of TPTH to workers. Label modifications highlighting teratogenic risks and requiring protective gear and the adoption of engineering controls (use of water soluble packs, closed mixing/loading systems, and mechanical transfer systems) have significantly reduced worker exposure to TPTH. The availability of dermal developmental data and data on dermal absorption have enabled the Agency to refine the 1985 risk assessment used in the PD 1, which assumed 100% dermal absorption and minimal worker protection. The risks associated with exposure to TPTH are thus considered to be outweighed by the benefits derived from its use. The Agency believes that exposure to TPTH does not pose an unreasonable risk to workers or the general public under currently labeled use conditions, which include classification as a Restricted Use Pesticide, engineering controls and protective clothing requirements.

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List of Subjects

Environmental protection.

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Susan H. Wayland,

Acting Assistant Administrator for Prevention, Pesticides, and Toxic Substances.

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