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Understanding Farm Chemical Use and Gender Roles: An Ethnographic Study Among Selected Strawberry Farmers in La Trinidad, Benguet

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Abstract

Chemical application has become prevalent in many farming communities, resulting in many health problems among farmers and consumers, including environmental degradation. This study aims to look at the factors influencing the use of chemicals by strawberry farmers in La Trinidad, Benguet–the way farmers sense exposure to toxicities, and their mitigating strategies. In addition, the gender roles assigned to family members in relation to pesticide application. Ethnographic data were collected, analyzed, and presented thematically. Results show that economic consideration is the main reason farmers use pesticides, as costs are high and as strawberries are easily attacked by pests and diseases. Farmers become aware of the toxicity of the farm chemicals through eye or nose irritation, resulting in the adaptation of strategies to prevent toxicity, which include the use of protective equipment, proper hygiene, and disposal of farm chemical containers. However, lenient practices of these strategies are observed in their 'safer' idea or in the green-labeled pesticides, which show their exposure. In gender roles, women also apply pesticides because of the need for labor in the production. This study concludes that farmers are still exposed to farm toxicities, and this danger is relatively considered in gender roles in farming.

Introduction

Agriculture remains the essential livelihood worldwide as it is the only food source for people. There is an estimated 884 million of the total world population in 2019 who were engaged in agriculture (Food and Agriculture Organization, 2021). In the Philippines, agriculture employed 10 million people in 2021, contributing 24.2% to the total national employment (Philippine Statistics Authority [PSA], 2022). In the Cordillera Administrative Region (CAR), farming leads the agricultural livelihood of the people. Among the provinces of CAR, Benguet has the largest crop production owing to wide farming areas and temperate weather suitable for producing highland vegetable crops (PSA, 2018). Thus, it gained the label as the "Salad Bowl of the Philippines". But aside from the flourished vegetables, strawberry production is gaining popularity among Benguet farmers because of the promised economic return. The Strawberry Farm in Betag, also known as Swamp, is the widest cultivation area in the municipality of La Trinidad, making it known as the "Strawberry Fields of the Philippines" from the 1990s until the present (Municipal Local Government Unit of La

Trinidad, 2020). From the data of the Office of the Provincial Agriculture (OPAG-Benguet (2022), almost all municipalities of the province have been cultivating strawberries from 2016 to 2020. The municipalities of La Trinidad, Kibungan, Mankayan, Tuba, Tublay, Buguias, and Atok were the top seven (7) producers of fresh strawberries from the said years.

In crop farming, the use of farm chemicals is prevalent. Many farmers choose to use chemicals to keep weeds and pests from destroying their crops and to add more nutrients to the soil (Tudi et al., 2021). However, the excessive use of farm chemicals threatens sustainable food production, thus contributing to issues of environmental degradation. In a study conducted by Sidchogan-Batani et al. (2013) in understanding suicide in relation to pesticides in farming areas in Mountain Trail, results show heavy use of farm chemical inputs throughout the production process in a specific measurement of land. Several reasons were also identified in the study why many farmers rely on the use of pesticides for their production. The use of fertilizers in crop establishment and farm chemicals in maintenance helps in growing 'first-class' harvest, which is preferred by buyers. In addition, applying farm chemicals lessens labor costs for either family or hired labor. These findings can also be applied in the production of strawberries. Suestos (2024) stated that the strawberry production in Benguet is highly dependent on inorganic fertilizers, which adds to its high production cost. This goes with the study of Mangili et al. (2014) that proves the presence of pests and diseases like Fusarium wilt, which has been resulting in a bad crop, forcing the farmers to use farm chemical treatment to produce 'quality' strawberries and to recover from their expenses.

The exposure of humans to farm chemicals has been proven harmful. Depending on the chemical's active components, doses, and exposure, it may cause acute, chronic, delayed, and allergic sickness. Some examples include cognitive effects, cancer (breast, liver), fertility problems, and respiratory disorders, among others (Ahmad et al., 2024). In a United Nations report in 2017, at least 200,000 people die from toxic exposure to pesticides per year across the world (Rifai, 2017). In addition, in the study of Sidchogan-Batani et al. (2013), suicide with the use of farm chemicals has been an experience in the locale of the study, and it is what the research tried to address, making the community aware of the negative effects of pesticides and making the chemical company accountable for the results of their products.

In agriculture, women present a crucial resource in the rural economy and for sustainable development and food security through their roles as farmers, laborers, and entrepreneurs (FAO, 2011; Gautam et al., 2024). These roles differ across the world and in the type of agricultural activities. However, their labor is sought mostly in planting, weeding, and harvesting. These women are also engaged in post-harvest tasks, such as threshing, processing, and marketing. Meanwhile, men's roles are focused on spraying chemicals and fertilizers and mechanized tasks (Raidimi, 2014). In another study, Quisumbing and Doss (2021) stated that, when men clear the field, women plant the seeds and weed, and they jointly harvest the crops. Though claiming that work in the field is done by both male and female, it reflects at the same time that women's labor in the agricultural sector is as important as the labor of the male members of the family, and it must be recognized the same way as their male counterparts. Recognizing the needs and support that women deserve in their farm activities. Moreover, studies on pesticide exposure to women (and children), present diseases that are more susceptible to them, like breast cancer and other hazards (Bassil et al., 2007; Dahiri et al., 2021). In a study conducted in Benguet, titled "Gender Analysis of Women in the Philippine Agriculture and their Occupational Issues", Lu (2010) looked at occupational issues of women farmers and the factors attributed to these issues. Since farming in Benguet is family-based, women also perform activities on the farm, including farm chemical application, making them exposed to different kinds of sicknesses. The study revealed that women experienced muscle pain, weakness, and easy fatigability after exposure to pesticides. Other occupational health issues resulting from pesticide application are fever, loss of appetite, blurry vision, eye problems (itching, redness, eye pain), and respiratory problems, among others. Some cultural factors attributed to these are: the belief that makeshift PPEs are good as the required (cultural), absence of surveillance of health and injuries among women (political), and health as a cost (socio-economic factor).

In the municipality, many have been practicing conventional farming, which relies on the use of inorganic materials and the application of farm chemicals in growing strawberries. This practice is common not only in La Trinidad but in other

municipalities of Benguet. Thus, exposure of the farmers to toxic chemicals cannot be overlooked. Taking a closer look at the relationship of chemical use and gender roles would help understand the risks (female) farmers confront in their daily activities, thus suggesting a workable solution to prevent or minimize these risks. This is where the study would like to come in and look at the different factors or meanings the farmers attach to farm chemicals in order to understand the reasons behind their reliance on farm chemicals. In addition, on how they make sense of chemical exposures and the strategies the farmers employ for the purpose of protecting themselves and their family members from the harmful effects of pesticides. Furthermore, this study is interested in looking at the gender roles the farmers assign in relation to farm chemical application, looking at the health and other aspects that may influence their practice, as women (and children) are seen on the farms performing various tasks.

This paper then specifically aims to (1) determine the experiences and perceptions of strawberry farmers in using farm chemicals; (2) look into how strawberry farmers make sense and avoid chemical exposure; and (3) explore gender roles in strawberry farming in relation to the use and exposure to farm chemicals.

Methodology

The qualitative study utilizes an ethnographic design that necessitates researchers to study the people's lives within their natural context, often involving immersion in the community to gain a deeper understanding of local practices. In this study, extended field engagement was made possible through the researcher's involvement in a separate project that examined the conditions of strawberry farmers and their production of processed strawberries in 2022 and 2023 in the same locality. This prior engagement enabled the researcher to observe how farmers discussed, perceived, and responded to challenges in their farming and processing activities. Building on this immersion, data collection for the present study involved returning to the field in the succeeding months of 2023 to conduct repeated participant and direct observations, as well as informal interviews across the various stages of strawberry production, particularly during periods of chemical application. Furthermore, key informant interviews with the use of guide questions were utilized. Product technicians who also visit the farms to promote agricultural inputs were interviewed for additional information.

This paper is guided by the Embodied Ecologies framework that looks at how human bodies interact with a multiplicity of chemicals in everyday human life, beginning from the understanding that we live in an unevenly polluted world. While regulators and environmental health scientists have focused on specific (groups of) chemicals and exposure routes, the Embodied Ecologies look at everyday life under the pervasive but uneven exposure to a cocktail of potentially harmful chemicals (Hardon, 2021). Meaning, seeing the cumulative chemical exposure of the human body to toxicities. The framework's approach is by looking at (1) how exposures are sensed and experienced by the (semi-) permeable bodies; and (2) the myriad ways in which people act to mitigate chemical harm (Hardon, 2021). The framework is localized by focusing on how strawberry farmers sense, interpret, and respond to chemical exposure during everyday farm work, including spraying, mixing, and re-entry. It also highlights the locally situated strategies farmers employ to mitigate perceived chemical harm. Although, the focus is on urban places, this framework is wide as to include pesticide applications, most especially in urban farming. It is seen that this framework is suitable as the locale and the research participants are in a semi-urban area.

In connection with gender roles in pesticide application, the study entered the field with Moser's gender analysis framework. Though more focused on designing interventions to recognize and include women, most especially in decision making, the initial phase of understanding roles in the farm by answering the question 'Who does what?' (Ludgate, 2016) would allow us to see the gender roles in the strawberry farm, including pesticide applications and the reasons behind this action.

This study was conducted in a strawberry farm located in La Trinidad, Benguet. The wide plantation of strawberries in the whole municipality is attributed to the unique cool climate of the place that favors the commercial production of strawberries (Kudan, 2017). Aside from the fact that La Trinidad is one of the widest strawberry plantations in the province, it is also observed that it consumes a great number of chemicals for its production, and the exposure of

the farmers to toxicities cannot be overlooked in this situation.

Purposive sampling was used to select participants for this study. Although many farmers in the area practice conventional farming, five farmers were closely involved in the research process. This number was partly due to research fatigue among other farmers, which they attributed to repeated participation in various studies over the past years. The selected participants were chosen based on their willingness to participate and their relevant experiences. Notably, these individuals had previously taken part in a related study involving the understanding of the growth of the local strawberry industry by knowing its situation before, during, and after the COVID-19 pandemic. Participants were fully informed about the purpose of the study and the type of information being collected. They were also made aware that they could withdraw from the study at any time if they felt unwilling to continue.

Four of the farmer participants were aged 50 and over, while one is aged below. Among the farmers, three were males and two were females. Four of the farmers are married, and one is single. The profile of the research participants is presented in Table 1.

To understand and analyze the information gathered from the participants, thematic analysis was used. Thematic analysis is a method for analyzing qualitative data, offering a structured yet flexible approach to identifying, analyzing, and reporting patterns or themes within a dataset. It includes: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing the report (Ahmed et al., 2025).

Results and Discussion

Strawberry Farming System

Strawberry production generally follows the eight (8)- month planting period. Starting with planting in late September or early October, up to the early harvest in December. The peak of harvest is in the months of February to April. The last harvest is by the end of May or in the early weeks of June. Off-season strawberries are harvested in the months of June to November. The strawberry plantation involves five general activities: (1) *Land preparation* includes activities like clearing, plowing, basal fertilizer application, seedbed preparation, mulching, and holing of the plastic mulch; (2) *Crop establishment* involves seedlings/runner preparation, planting/ transplanting, and replanting; (3) *Crop maintenance* is composed of fertilizer application, weeding, spraying of chemicals, spraying of concoctions, water management, and pruning or locally termed as 'laslas'; (4) *Harvesting* of strawberries is mostly done twice a week for six months; and (5) *Packaging and transportation* include activities like sorting/grading strawberries, hauling, transporting and cleaning, and repacking.

After the eight (8) month period, the farmers uproot their strawberries and plant lettuce as part of crop rotation. This practice helps reduce agriculture's dependence on external inputs through internal nutrient recycling, maintenance of the long-term productivity of the land, and breaking weed and disease cycles (Gebremedhin & Schwab, 1998; Yu et al., 2022). This is also ideal for strawberry farm sites that are flood-prone during the rainy season. Lettuce is preferably planted during the rainy months as the production period only lasts for an average of 60 days.

Table 1

Profile of the Research Participants

Respondents	Age	Gender	Civil Status	Address
1	56	Male	Married	Balili, La Tinidad, Benguet
2	44	Male	Married	Betag, La Trinidad, Benguet
3	52	Male	Single	Buyagan, La Trinidad, Benguet
4	58	Female	Married	Buyagan, La Trinidad, Benguet
5	58	Female	Married	Balili, La Trinidad, Benguet

Pesticide application depends on every farmer. But commonly applied are insecticides, fungicides, and miticides to prevent diseases and pests such as mites, white grubs, molds, leaf spots, and other insects attacking the strawberries. These are applied alternately, and the application is on average twice monthly until the end of the cropping season. However, chemical use becomes very frequent during the fruiting stage, which is two to three times weekly or every after harvest. In the afternoon of harvest days, inducers are sprayed to help the fruits ripen and be ready for picking the following days.

Similarly, in Vietnam's Dà Lat region, strawberry farmers reportedly apply pesticides up to once every three days during the wet season to control pests and diseases. The commonly used pesticide application schedule consisted of frequently planned application moments: application frequency ranged from two times a month up to three times a week (Houbraken et al., 2016). In a study conducted in Beijing, China, analyzing strawberry samples collected from markets between 2017 and 2018, found that several samples exceeded the country's established Maximum Residue Limits (MRLs) (Li et al., 2022). This indicates that those strawberries contained higher levels of pesticide residues than legally permitted, potentially making them unsafe or harmful for regular consumption. This could mean the higher dose of pesticides being applied to strawberries to maintain their healthy condition.

Farm Chemicals and Market Price

The use of farm chemicals in strawberry farming is explained by various reasons. Firstly, it is for economic purposes because strawberry production is costly. Often noted phrases from the farmers are "*Nangina ti agimula ti strawberry*" (Planting strawberries is expensive-RP3) because of several factors. Hired and family labor are the most expensive inputs, followed by farm chemicals and fertilizers, and other inputs such as plastic mulch and farm assets maintenance. If farmers do not have their own planting materials, they are left to buy strawberry runners for a cost of Php20,000 to Php40,000 for a 500 m^2 area, adding to their input costs. Farmers who rent land for their production have to allot money for this cost. In unpublished research conducted by Salda et al. (2006), a total of input cost of Php300,000 including fertilizers, farm chemicals, labor, and other materials, was recorded by one of their respondents covering a certain area. The non-application of farm chemicals to produce 'quality strawberries' would mean non-recovery of the expenses used by the farmers.

Furthermore, the prices in the market for strawberries easily change, and wholesalers and retailers in this situation have the ultimate power to declare the price. Before the COVID-19 pandemic, a kilo of strawberries was purchased by wholesalers for Php200 to Php250 for the early months of harvest. In peak seasons, the price can go as low as Php80 to Php150 a kilo. Off-season strawberries can reach Php250-Php350 a kilo. However, this is not always the case, as the wholesalers determine the prices of strawberries depending on the size, color, or quality. As a result, many farmers separate a portion of their produce and sell it independently to individual buyers. However, this setup does not guarantee the sale of all their strawberries, as there is competition among their co-farmers. So, in order to assure the market of their products, they needed to produce 'first-class' strawberries that could compete with the strawberries of other farmers in La Trinidad, and strawberries coming from other municipalities in Benguet. This results in the frequent application of farm chemicals. Twice-a-week application during harvest season is the best example. As observed, a farmer sprayed a flower inducer in the afternoon, after the harvest and marketing of the strawberries in the morning. In some cases, other farmers would double the dosage of chemicals in a single application, with the thought that the protection and harvest of their strawberries would double. It was described by one of the research participants during an interview, saying "*...Isunga din dosage di usaren da sin mamingsan, katapi da et. Imbis nga esa, kaitapi da et si duwa.*" (That is why the dosage that must be applied once, they add more. Instead of one, they add two RP1.)

In addition, it was revealed that the use of farm chemicals serves as a labor and time-saving strategy for farmers. Since farmers are engaged in other income source activities like rendering hired labor to their co-farmer or managing additional plots in different locations, they adopted this strategy in order to give them ample time for their secondary activities. As a result, pesticide applications tend to become concentrated within specific agricultural seasons. In some cases, farmers reported intentionally increasing the dosage during a single application with the belief that doing so would eliminate the need for repeated spraying in the following days. This practice reflects a perception that a higher initial

dosage can provide prolonged protection, thereby saving time and reducing the frequency of labor-intensive pesticide applications.

Secondly, the presence of pests and diseases yields no income to farmers when neglected. The most serious disease of strawberries during the rainy season from June to September are leaf spots and fruit rot caused by grey mold. In addition, mites, fruit flies, white grubs, slugs, and lizards during summer destroy the fruits of strawberries (Kudan, 2016). Furthermore, all of the farmers themselves are conscious of the soil condition of their planting areas, saying, "*Narigat gamin tan wada met di sakit di daga*" (It is difficult because the soil is in a bad state-RP3), referring to the presence of fusarium wilt. As highlighted by one of the research participants, "*Malugi ah, nu adi apply-an si farm chemicals et awan, tan kanen di pesti. Diyay mites launay ken jay egges, kanen da amin nga awan ti mabati,*" (It will lead to bankruptcy if we do not apply farm chemicals because pests will eat it. The mites especially, the worms eat everything and nothing is left-RP2). In the experience of one of the research participants, they uprooted most of their strawberry plants because the plants wilted in the month of March, leaving the family bankrupt in the following months. Also, during summer, mites attack the plants, and even the 'strongest' pesticides they use cannot destroy them as described, so the application must be doubled and upgraded. In a statement of another research participant on the question of practicing organic farming:

> "*Dinamag iman din anak ko sa, nu mabalin ipadas di organic farming, karkaro tan strawberry nan esek mi. Baken mauto, makan ay fresh. Ngem di kanan angkel na: 'Ngem nairwamen jay daga nga maspray an, nga maikkan ti chemical. Tanu haan mo nga spray an, ado eges nga mapan, ado ti predator na, ado ti sakit na. Ti pangprevent mo idta ket jay chemical, tapnu mairuwar mo jay income na ken pakanen daka, mabiyag ka.'*" (My child asked me about it, if we could try organic farming, especially that our plant is strawberry. It is not cooked, and eaten fresh. But her uncle answered: 'But the soil is already used to sprays, to chemicals being applied. If we do not spray it, many worms will attack it, other predators, and diseases. The only way to prevent it from happening is to apply chemicals. You will have income, and that way, it will feed you, it will let you continue to live. -RP4)

The farmers closely associate farm chemicals with income. Hence, the application of pesticides would mean a 'quality' harvest because of the benefit of it in producing disease or pest-free strawberries that can be sold at a greater price and would be able to compete with the produce of other farmers. In addition, the costs in labor saved from the concentrated application also mean a return to the farmers. This observation is also true among other farming communities in Benguet, where the primary reason for the application of farm chemicals is for good produce, most especially to those who plant vegetables, where they often try to catch the 'jackpot price' (Sidchogan-Batani et al., 2013). So, for the farmers, the absence of pesticides and other farm chemicals would mean a loss in their income.

Nose and Eyes as Measures for Toxicity

Farmers are aware of the toxicity of farm chemicals. Most of their knowledge is mainly from their own experiences, followed by the experiences of their co-farmers in the field. Other information comes from 'technicians' or product promoters who visit them on their farms with a short discussion of the benefits, and the dos and don'ts of their products. But still, the farmers judge the toxicity of the products based on the immediate effect of the chemicals on the nose and the eyes. If they experience a burning or painful sensation in these areas, they know that the product is toxic. The burning sensation in the eyes and the strong smell or the discomfort in the nose when farm chemicals are inhaled upon opening or during mixture are some of their indicators that the products they are using are toxic. When such events happen, they would pause and rinse their eyes or nose, but will continue applying when the feeling of discomfort subsides. This is because of the belief that it is what the plant needs. However, others would discontinue using it and look for other brands that have the same effect but do not cause them immediate and obvious harm.

The experiences of their co-farmers are an important basis for their health practice. In one narration, the research participant shared the experience of his co-farmer saying,

> "*Way udom ay ammok, kaikiwar sin takkay na, aga di nanbu-an na. Sin 2000 en ay nailak ay binmala di sakit nan ay complicated ay naala na sin chemical. Tan kaman na di ngarud, uray nu inbabado na ay kaman nina,*

ngem nan-spray met baw, us-usaren na baw metlang nu man-ubla si sabali, nu sumaa sya ladta di." (I know someone who used his hands to stir the chemicals. In 2000, I saw his sickness become complicated, which he got from the chemicals. It really is like that, even if he wears this (long sleeve), he sprays, he still wears it while doing other work, until he goes home-RP1).

As a result, they make an effort not to follow the practices of their co-farmers, which they think is harmful to them. But this experience can be an illustration of cumulative chemical exposure of the body because of long-term use of farm chemicals and their management. The strong or potent farm chemicals like insecticides is used with caution since they sting or bring discomfort in the eyes and nose, and in rare cases in the skin of the farmers.

It is then understood that the farmer's knowledge of toxicities from farm chemicals is heavily based on their experiences, though other factors are contributory to their understanding of chemical exposure, their own bodies and experiences remain the indication of exposure.

This result is closely related to the framework-the toxicity is not primarily understood in its technical conditions or explanations, but rather through direct sensory experiences of the farmers. The indicators of danger reflect the framework's idea that chemical interactions are sensed before being rationalized.

Mitigating Ttoxicities from Chemicals

With the knowledge that farm chemicals can be toxic to health, farmers adopted strategies in order for them to ensure their safety from farm chemicals, most especially from insecticides, miticides, and weedicides, or those that immediately irritate their eyes and nose. They use personal protective equipment, which normally includes masks, gloves, and boots. During the application of concentrated or higher doses of pesticides, they do not expose their hair and skin while spraying, so the use of long sleeves, long pants, and caps/hats is necessary. But often eye cover or eye protection is absent.

Another mitigating strategy they identified is the disposal of waste materials. Farmers used to collect the containers of pesticides they used and return them to the 'farm supply' where they bought the product. In exchange for this, farmers get a free sample of a new farm product or a t-shirt. But because of the regulations during the pandemic, which include the community lockdowns, the chemical containers used by farmers were left on the farms. Since then, farmers were left to dispose of their farm chemical containers. They segregate the containers from other garbage and leave the containers on the farm. During garbage collection days, chemical containers are collected by garbage collectors. At present, farmers still apply this strategy for the regulations before the pandemic have not yet been reinstated. But this claim of the research participants does not apply to all farmers. In observations on the farm, farm chemicals are not properly disposed of or are not segregated. Others leave their product containers exposed along the pathway or near their plants, which may expose passersby or their co-farmers to toxicities.

It is also important for the farmers to protect family members from the toxicity of farm chemicals. They make sure to keep themselves clean before interacting with their family members. They change their clothes and wash their hands on the farm before going home. Farmers make sure to take a bath and wash the clothes they have used during pesticide application when they get home. Clothes used on the farm are separated from other laundry. In the case of the research participants (RP1, RP4, RP5) who have grandchildren, they make sure not to touch/carry the young members of their families before bathing "*Wen, adik paylang egenan [grandson] bago adik paylang nan emes...*" (Yes, I do not touch him [grandson] if I haven't bathed yet-RP4), or make physical contact with the members of their households. Additionally, they inform their family members early that they will apply chemicals. Household activities such as cooking and cleaning are only performed after the farmers clean themselves, so as not to contaminate food or other materials at home. These actions that the farmers do show what the framework describes as ways in which people act to mitigate chemical harm not only to themselves but also to a wider community.

The Safer Farm Chemicals

Pesticide labels are generally the main mechanism for communicating risk and using the information to end-users (Rother, 2018). Each label represents a level of toxicity that the farmers must be aware of. The categories followed

here in the Philippines are from I to IV, where I contains extremely toxic chemicals and IV contains slightly toxic chemicals. Specifically: Category I as Danger: Poisonous with a color band of Red (extremely toxic); Category II as Warning: Harmful with a color band of Yellow (highly toxic); category III as Caution with a color band of Blue (moderately toxic); and Category IV with a color band of Green (slightly toxic) (Pesticides Regulation Division, 2020). With this, most of the farm chemicals used by strawberry farmers have signal words such as the words 'Danger', 'Warning', and 'Caution', and the color band symbols. The confidence and comfort of less exposure to toxicity among farmers is the label of the farm chemicals they use. So long as it is within the range of not prohibited since it is green-labeled and slightly toxic, they apply it, and the sense of security of using these is present among them.

The farmers have a concept of less dangerous or safer farm chemicals or 'sasaew' or 'imbag pay', or even 'pipiya pay' in the local term. These terms are used when referring to events or materials that give one a better feeling over the other. An example of this is "*sasaew nan product 'A' tan baken man-idawat si sakit di mata, kompara sinan product* 'B' (product 'A' is better than product 'B' because it does not sting the eyes-RP2). According to the farmers, there are fewer dangerous farm chemicals because they do not cause them physical discomfort either in the nose, eyes, or even skin when opening the containers or during mixture. The safest are the green-labeled products and the fungicides. Fungicides are considered less dangerous because the farmers do not feel any pain or irritation in the nose or eyes during the mixture or application. As a result, they do not see the need to wear other personal protective equipment (PPEs) such as gloves when using this product. However, pesticides enter the body mainly through the skin (Damalas & Koutroubas, 2016). Fungicides have acute toxicity that can result in skin and eye irritation. Studies show fungicide poisoning and death caused by this chemical are also present (Nendick et al., 2022). In interviews with chemical technicians who visited the farmers to promote their products, they said that even in fungicides and green-labeled products, farmers must strictly use their PPEs even if they do not feel immediate negative effects on their health, as this would accumulate and may cause them harm in the long run. In addition, in the identified farm chemicals the farmers are using, at least one product belongs to category II, and two or more products belong to category III in insecticide, miticide, and weedicide. At least two products belong to category III in fungicides. This could mean that farmers are still exposed to higher levels of toxicities without knowing it. So even with the mitigating strategies identified, the loyalty of the farmers to strictly adhere to these is not properly observed in certain conditions, like the application of safer chemicals as mentioned above, and during hot days, hence gloves and long sleeves are not comfortable, and as the farmers described, they restrict their movements. It is then understood that farmers are exposed to certain toxicities from farm chemicals because of cultural factors. These toxicities then accumulate and may cause health risks in the long run.

Pesticide Application as a Role of Women and Men

Division of labor among men and women in agriculture concentrates "heavy" and "dangerous" farm activities on men. In addition, access to resources in agriculture has been an existing problem for many societies, as it only focuses on men. In a review of Phelps (2024) on different research about women and youth participation in agriculture, it was found that there is limited access to information, and the training on proper use of pesticides also overlooks women farmers, assuming they do not handle pesticides, even though they are exposed in different ways. This is the reason why many gender analysis toolkits in agriculture were developed to look at the issues and problems in agriculture related to gender. Examples are the Harvard Analytical Framework and the Moser Gender Analysis Framework which includes gender role identification in production, reproduction, and community management, which is used to analyze the struggles faced by men and women involved.

In the research site, most of the farmers who were interviewed, including those who were involved in the informal conversations, mentioned that heavy and dangerous activities are done by men and light and less dangerous activities are performed by women. 'Heavy and dangerous' activities, according to the research participants, are activities like clearing, plowing, seedbed preparation, application of fertilizers and chemicals, watering, hauling, and transporting. Meaning, anything that may negatively affect the body or where much energy is exerted. 'Light and less dangerous' activities are mulching, holing the

mulch, runner preparation, planting, replanting, weeding, pruning, harvesting, sorting, clearing, and repacking.

According to the male research participants, gender is considered in farming activities. Strawberry activities, from land preparation to marketing, are shared by both male and female members of the family. But, activities like plowing and farm chemical applications are not given to women as it is dangerous to their health. Suggesting that they try to protect their family members from the toxicities of the farm chemicals. In addition, portraying their respect to the women members of their family (cultural). "*Aw ah, way nirespeto si babae*" (Yes, the respect to women-RP1) as they stated and agreed. However, it is not always the case. Women participants in this study, having the knowledge that farm chemicals may harm their health, still apply pesticides. It is also observed in the farm that women still perform 'heavy' tasks. A female research participant in this study takes part in all activities from land preparation to the marketing of strawberries. In spraying farm chemicals, she uses a manual knapsack sprayer which can contain sixteen (16) liters of water and pesticide mixture. She does the mixing of farm chemicals and manually sprays her strawberries. In watering, she uses a small water pump and single-handedly waters her plants. She manages her farm all by herself and with some help from her sibling, who manages a different plot.

> *"Isunga uray babae ak, man-ubla ak, karkaro din sana manspray. Adik sed-en paylang din kabsat ko ay manspray wenno makdeng sisya tan wada met abo iman di garden na. Sayang di agew, kapilitan ay sak-enen."* (Even if I am a woman, I work, especially in spraying. I will not wait for my sibling to do the spray or wait for him to finish, because he also has his garden to take care of. It is a waste of time; it is necessary that I do the spraying-RP4).

When asked about the difference between male and female performance in pesticide application, the research participant proudly responded, "*Maga, the same*" (None, the same-RP4). Showing her confidence in her actions. In addition, she prefers to be in charge of most of the activities to ensure the good production of her strawberries, thus having control over her resources. It is also observed here in Benguet that women do 'heavy' tasks, as farming is considered family-owned. Other studies also present that women are now empowered in the agriculture sector in different parts of the world. In research conducted in Indonesia, Myanmar, the Philippines, and Thailand with a research title, "Women's Empowerment and Gender Equity in Agriculture: A different perspective from Southeast Asia" (Akter et al., 2017), the participation of women in agriculture and in the household was evident, women divide their time between their roles, making them empowered by allowing them access resources and performance of different tasks in the field, not just their managerial tasks at home.

Despite narratives suggesting that chemical application and "heavy" tasks should be reserved for men to protect women's health, the observed reality contradicts this ideal. Women continue to engage in activities marked by direct exposure to toxic substances and physical strain. This clearly situates their labor within a field of cumulative chemical exposure, where their bodies become sites of ecological vulnerability and economic necessity.

Conclusions

Farmers see farm chemicals as an important component of their production. It is seen that the application is driven by different factors, but mainly because of economic reasons, to gain a higher income that would compensate for all of their production costs. Farmers are knowledgeable that farm chemicals are dangerous; aside from the labels of the products they use, they become conscious of these through sensing, with nose and eyes as major tools for knowing toxicity. However, even with this knowledge and experiences, the lenient use of PPEs, their safer idea of farm chemicals, and the disposal of farm chemical container practice still expose them to toxicities. Their practice of personal hygiene at home after chemical application may indicate a somewhat preventive measure to protect their family members from toxicities; however, their exposure is still evident. Women's participation in the farm chemical application reflects the necessity of accomplishing farming tasks. Health concerns, though acknowledged, are often not prioritized. This reflects the complex reality of cumulative exposure, where gender, labor, and toxicity intersect in everyday farming practices.

Recommendations

Given the results of the study, there are two major recommendations derived. First is a formal transfer of knowledge among the farmers on the toxicity of farm chemicals, understanding farm chemical labels and contents, and the proper use of personal protective equipment, which can be conducted through seminars or meetings with agencies or groups directly associated with the field. The second one is that policies must be developed and properly implemented in order to assist in the proper disposal of farm chemical containers, so as not to harm other involved parties, like their co-farmers or garbage collectors. With this, farmers might be helped to lessen their exposure to farm chemical toxicities and continue to protect themselves and their families.

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References

Akter, S., Rutsaert, P., Luis, J., Htwe, NM., San, S.S., Raharjo, B., & Pustika, A. (2017). Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia

Ahmad, F., Ali Ahmad, F., Alsayegh, A., Zeyaullah., AlShahrani, A., Muzammil, K., Ali Saati, A., Wahab, S., Elbendary, E., Kambal, Nahla, Abdelrahman. M., & Hussain, S. (2024). Pesticides impact on human health and the environment with their mechanism of action and possible countermeasures. *Heliyon,* 10 (7) https://doi.org/10.1016/j.heliyon.2024.e29128

Ahmed, S.K., Mohammed, R.A., Nashwan, A.J., Ibrahim, R.H., Abdalla, A.Q., Ameen, B.D., & Khdhir, R.M. (2025). Using thematic analysis in qualitative research. *Journal of Medicine, Surgery, and Public Health*, 6, 1-6. doi.org/10.1016/j.glmedi.2025.100198

Bassil, K.L., Vakil, C., Sanborn, M., Cole, D.C., Kaur, J.S., & Kerr, K.J. (2007). Cancer health effects of pesticides: systematic review. *Canadian Family Physician,* 53 (10), 1704-1711.

Dahiri, B., Martin-Reina, J., Carbonero-Aguilar, P., Aguilera-Velasquez, J.R., Bautista, J., & Moreno, I. (2021). Impact of pesticide exposure among rural and urban female population. An overview. National Library of Medicine: *National Center for Biotechnology Information,* 18(18). 10.3390/ijerph18189907

Damalas, C.A. & Koutroubas, S.D. (2016). Farmers' Exposure to Pesticides: Toxicity Types and Ways of Prevention. *National Library of Medicine: National Center for Biotechnology Information,* 4(1). 10.3390/toxics4010001

Food and Agriculture Organization. (2011). The role of women in agriculture. Prepared by SOFA Team and Cheryl Doss., ESA Working Paper No. 11-02. https://www.fao.org/3/am307e/am307e00.pdf

Food and Agriculture Statistics. (2021). FAO: Ag employs 27% of world's workers, generates 4% of GDP. The Regents of the University of California, Davis campus. https://migration.ucdavis.edu/rmn/blog/post/?id=2510

Gebremedhin, B., & Schwab, G. (1998). The economic importance of crop rotation systems: evidence from the literature (No. 1099-2016-88971).

Gautam, V.C., Umriyal, H., Agarwal, D., & Priya. (2024). Role of Women in Agriculture. Scientific Innovation Magazine. https://www.researchgate.net/publication/384328282

Hardon, A. (2021). Embodied Ecologies: A collaborative inquiry into how people sense, know, and act to reduce chemical exposures in everyday urban life

Houbraken, M., Bauweraerts, I., Fevery, D., Labeke, MC. V., & Spanoghe, P. (2016). Pesticide knowledge and practice among horticultural

workers in the Lâm Đồng region, Vietnam: A case study of chrysanthemum and strawberries. *Science of the Total Environment*, 550, 1001-1009. doi.org/10.1016/j.scitotenv.2016.01.183

Kudan, S.L. (2017). Ecological Way of Producing Strawberry. Benguet State University, Philippines

Li, J., Chen, W., Deng, K., Liu, S., Li, B., & Li, Y. (2022). Monitoring and dietary exposure assessment of pesticide residues in strawberry in Beijing, China. *Food Additives & Contaminants,* 15(2), 98-105. 10.1080/19393210.2022.2028311

Lu, J.L. (2010). Gender Analysis of Women in the Philippine Agriculture and Their Occupational Issues. *Journal of International Women's Studies,* 11(4), 73-82. http://vc.bridgew.edu/jiws/vol11/iss4/5

Ludgate, N. (2016)., Moser Gender Analysis Framework. https://ingenaes.illinois.edu/wp-content/uploads/ING-Info-Sheet-2016_09-3-Moser-Triple-Role-Framework-Ludgate.pdf

Mangili, T.K., Oloan, R., & Lorezco, TM. (2014). Trichoderma-Based Management of Soil-Borne Pathogens of Selected Crops in the Highland, *ANAP Research and Development Journal*, 11 1-3.

Municipal Local Government Unit of La Trinidad. (2020). La Trinidad History. https://latrinidad.gov.ph/profile/

Office of the Provincial Agriculture. (2022). Strawberry production (Metric tons) by Municipality of Benguet 2016-2020.

Nendick, E., Mohamed, F., Raubenheimer, J., Gawarammana, I., Buckley, N., & Eddleston, M., (2022). Acute fungicide self-poisoning-a prospective case series. *Bioscience Clinical Toxicology,* 60(10), 1106-1112. https://doi.org/10.1080/15563650.2022.2105710

Pesticides Regulation Division. (2020). Policies and Guidelines (3rd ed). Fertilizer and Pesticide Authority, Department of Agriculture. FPA Building, Bureau of Animal Industry Compound, Visayas Avenue, Diliman Quezon City. https://fpa.da.gov.ph/NW/images/FPAfiles/DATA/Regulation/Pesticide/Book2020/PoliciesandImplementingGuidelines2020-P.pdf

Phelps, S. (2024). Gender Equality and Youth Inclusion in Agriculture: Findings from CABI gender research. CABI Gender Analysis Findings. https://www.cabi.org/wp-content/uploads/CABI-Gender-Analysis-findings-2024-July.pdf

Philippines Statistics Authority. (2022). 2022 Selected Statistics on Agriculture and Fisheries. Philippines Statistics Authority, PSA Complex, East Avenue Diliman, Quezon City, Philippines. https://psa.gov.ph/sites/default/files/%28ons-cleared%29_SSAF%202022%20as%20of%2030082022_ONS-signed.pdf

Philippines Statistics Authority. (2018). 1st Semester 2018 Crop Production of CAR., Philippines Statistics Authority, PSA Complex, East Avenue Diliman, Quezon City, Philippines., http://rssocar.psa.gov.ph/agriculture-releases/1st%20Semester%202018%20Crop%20Production%20of%20CAR#:~:text=Benguet%20was%20the%20top%20producer,97.78%20percent%20of%20the%20total

Quisumbing, A.R & Doss, C.R. (2021). Gender in agriculture and food system. Handbook of Agricultural Economics, 5, 4481-4549 https://doi.org/10.1016/bs.hesagr.2021.10.009

Raidimi, E.N. (2014). The Roles and activities of women in the six selected agricultural projects in Thulamela local municipality of Vhember district municipality in the Limpopo Province. *South African Journal of Agricultural Extension*, 42(2). https://www.ajol.info/index.php/sajae/article/view/115945

Rifai, R. (2017). UN: 200,000 die each year from pesticide poisoning., Al Jazeera media network 2022. https://www.aljazeera.com/economy/2017/3/8/un-200000-die-each-year-from-pesticide-poisoning

Rother, H.A. (2018). Pesticide labels: Protecting liability or health?–Unpacking "misuse" of pesticides. *Current Opinion in Environmental Science & Health*, 4, 10-15.

Salda, V., Tad-awan B., & Pablo, J. (2006-2007). Production and Postproduction Practices on Strawberries, Funded by DA-BAR, Benguet State University.

Sidchogan-Batani, R., Anongos, S.F., Gapasin, M., De Guzman, R.D., Listino, B.C., Sa-ao, B.C., Sagandoy, T.C., & Taag, G. (2013). Pansig'dan: Promoting Well-being in an Agricultural Community in Northern Luzon, Philippines: Understanding Suicide in the Context of Cash Crop Farming. Benguet State University, La Trinidad, Philippines

Suestos, J. (2024). Supplementation of naturally fermented solutions (NFS) to production management of strawberry (Fragaria x ananassa) Grown in Isabela, Philippines. *International Journal for Multidisciplinary Research,* 6(3), 1-20 https://doi.org/gtw6tb

Tudi, M., Daniel Ruan, H., Wang, L., Lyu, J., Sadler, R., Connell, D., ... & Phung, D. T. (2021). Agriculture development, pesticide application and its impact on the environment. *International journal of environmental research and public health*, 18(3), 1112. 10.3390/ijerph18031112

Yu, T., Mahe, L., Li, Y., Wei, X., Deng, X., & Zhang, D. (2022). Benefits of crop rotation on climate resilience and its prospects in China. *MDPI Journal Agronomy*, 12(2) https://doi.org/10.3390/agronomy12020436