



Evaluation of working conditions in coffee farms in the department of Quindío (Colombia)

Evaluación de las condiciones de trabajo en fincas cafeteras del departamento del Quindío (Colombia)

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INTRODUCTION

In Colombia, agriculture is categorized as one of the major sources of employment in the country. Coffee cultivation is one of the sectors that employ the largest number of peasant families. However, families dependent on this sector perform their work informally, without quality working conditions or links to social security and occupational risk system (Osorio-Quintero *et al.* 2019).

The agricultural and livestock sectors are exposed to various hazards derived from the activity, which can generate occupational events (occupational injuries and occupational diseases). Among the different hazards to which farmers are exposed are ergonomic hazards directly related to musculoskeletal disorders due to muscular and postural demands (Garzón Duque *et al.* 2017; Jankelova *et al.* 2017). In addition, there are skin disorders due to the use of pesticides, stings, and bites of poisonous animals, hazards of physical (UV), safety (mechanical), public (robberies, muggings), and psychosocial origin (drug addiction, alcoholism,

family violence), among others (López-Araújo & Osca Segovia, 2009; Gómez Yepes & Cremades Oliver, 2010; Ocampo & Osley Garzón, 2016).

The department of Quindío is a coffee production area with a diversity of crops, in addition to dairy and/or fattening cattle. It is the smallest department of the continental territory of Colombia, with a surface of 1,845 km². The department has 12 municipalities and 267 villages, of which 207 are coffee plantations with 6547 properties and approximately 5665 coffee growers, equivalent to 39 % of the rural area of the department (Paisaje Cultural Cafetero, 2021). The remaining area is distributed in other agricultural products, such as cocoa, beans, corn, bananas, sorghum, soybeans and yucca. Livestock farming also plays an important role in the regional economy, with breeding, raising, and fattening goats, sheep, pigs, and cattle.

According to the Food and Agriculture Organization of the United Nations-FAO, agriculture is one of the most hazardous sectors in terms of occupational fatalities and illnesses, and non-fatal

accidents. Daily workers face risks from activities such as operating heavy machinery and equipment, lifting loads, and working with animals. They are often exposed to extreme weather conditions, noise, excessive vibrations, chemicals, infectious agents, dust, and other organic substances. However, given the remote location of rural areas, agricultural workers often lack access to the health services, information, and training needed to adequately respond to such health risks. Vulnerable groups are most affected by this situation, including migrants, seasonal workers, the elderly, women, and children (FAO, 2022).

Based on this it can be stated that agriculture has three fundamental pillars: economic, environmental, and social (Hurst *et al.* 2007). Therefore, it is necessary not to unprotect this sector as part of the integral development of our department and country. The little concern for the working conditions and the vulnerability of the agricultural sector is reflected in the loss of capacity, injuries and health problems of the population. If these issues are not taken into account, they will continue to increase. Their consequences directly affect the productivity, and health of the population as its deterioration is greater compared to other productive sectors.

The objective of this research is to identify the occupational hazards to which farmworkers, who work in agricultural and livestock farms in the department of Quindío, are exposed.

MATERIALS AND METHODS

Due to the similarity of tasks of the farmworkers, they were organized into “groups of similar exposure” (GES). The grouping of the GES was done first by observational method (subjective/qualitative assessment) followed by sampling (quantitative characterization). Once the GES were formed, they were evaluated to identify those in which the potential for exposure to the agent represents a significant risk. In principle, the GES that have a higher risk potential will require immediate attention: these are the so-called critical GES, which will require complementary follow-ups, such as greater representativeness in sampling or administrative or technical controls to reduce exposure. Finally, all GES were prioritized (or ranked) based on their potential risk (Bullock *et al.* 2006).

A qualitative and quantitative observational descriptive study was carried out. Given the similarity of tasks in the agricultural sector, 82 farms were visited in 12 villages in 4 municipalities (Buenavista, Pijao, Calarcá and Armenia) and 139 workers were surveyed, most of them being farm managers or administrators (Table 1). The inclusion and exclusion criteria were voluntary participation. Data on the identification of occupational hazards were collected through a worker model survey (self-reporting of working conditions). Their workday was 12 hours a day from Monday to Saturday.

Table 1. Population characterization of farmworkers of Buenavista, Pijao, Calarcá and Armenia-Quindío.

| Item | Number of workers |
|---------------------|-------------------|
| Gender: | |
| Male | 95 |
| Female | 44 |
| Age (years): | |
| Less than 25 | 27 |
| 25 - 35 | 17 |
| 36 - 45 | 60 |
| 46 - 55 | 18 |
| More than 55 | 17 |
| Grade of schooling: | |
| Elementary school | 97 |
| High school | 40 |
| University | 2 |
| TOTAL | 139 |

The results analysis plan was taken from the GTC 45 guide. The inspections were carried out following the standard NTC 4114, as a control tool in the analysis of the information collected through the self-reporting of working conditions, and the guide GTC 45 for the identification of hazards and risk assessment (ICONTEC, 1997; ICONTEC, 2012).

The research was based on the regulations regarding occupational health and safety of the Decree 1072 of the Ministry of Labor

(Mintrabajo, 2015). Besides, informed consent was used as part of the suggestions of the Bioethics Committee of the University of Quindío.

RESULTS AND DISCUSSION

It was detected that 32 % of the workers surveyed were female head of household. All workers were economically active (18-55 years old); 43 % were between the ages of 36 and 45 years; 70 %

of the workers only attended primary school; 29 % attended secondary school and 1 %, studied at university.

The majority of workers did not own their own home (57 %) and 70 % had a marital union. Household expenses were equivalent to 70 % of their income and only rent was equivalent to 30 % of the income earned. 70 % earned the current legal minimum wage. As for the type of housing, only 29 % had their housing (property owners), 14 % lived in their family home (single) and the rest lived in rented housing.

All respondents said they were exposed to chemical agents typical of the agricultural sector (mainly pesticides, fungicides, and antiparasitic agents). 72 % were exposed to physical agents such as non-ionizing radiation (UV rays from outdoor work) and noise (handling scythes, tractors), and to anti-ergonomic conditions such as the stooped or bent back posture for many hours a day, as well as repetitive movements of the upper limbs and postural overload (handling heavyweights). 65 % were exposed to biological agents such as mosquito bites, ticks, and spiders; 61 % were exposed to dangerous energies such as mechanics (scythes and tractors), the use of hand tools (combs, spades, saws, hammers.). They reported having had incidents and even work accidents with moderate consequences (several days of incapacity). 56 % stated that they have no protection against theft and robbery (social risk), do not have emergency plans, fewer emergency brigades or training for emergency control and attention.

It was found that all the farms visited had sites for recreational activities. However, 80 % of the farms did not have an occupational health and safety management system or emergency plans.

The working population is exposed to inadequate safety conditions. The conditions of the work areas are precursors to generating work accidents. They also face the danger of operating machinery and tools in poor condition. In general, there is a lack of firefighting equipment and emergency plans. There is no evidence of first aid kits or fire extinguishers. In addition, the workers are constantly exposed to changes in temperature, heat, and cold, and non-ionizing radiation from sunlight is present in all work areas because they are working in open fields. Lighting is inadequate when night work is carried out on the farm, as there is a notable lack of sufficient lighting, which is directly related to the coffee processing activity. Noise in the environment is evident when using the pulping machines.

Regarding biological agents, it was found that in coffee crops workers are exposed to pests such as coffee berry borer and coffee rust. Likewise, workers involved in irrigation, fertilization, pruning, fumigation, and harvesting are exposed to diseases and discomfort due to exposure to these pests.

In all work areas, workers are constantly prone to physical and postural overexertion due to the different tasks they must perform. In general, their workday is monotonous. Working hours are long, especially during harvest time. There are no active breaks on the

farms, which could lead to low yields and poor performance on the part of the workers. Farmers and ranchers expressed the lack of efforts to improve their working conditions.

Workers usually lift and transport loads, especially in coffee harvesting, washing, and drying activities, repeatedly exceeding the permissible levels. The loads that are generally handled range between 60 and 70 kg in weight, with distances that vary between 100 and 500 meters from the harvesting site to the drying and harvesting site to the transport vehicles. In addition, the lack of knowledge of the correct way to handle loads causes the worker to do it inadequately. Mechanical aids for transporting loads are also very limited. The vast majority continue to handle them manually.

Fumigation activities, although not performed frequently, reflect a great lack of knowledge on the part of the working population regarding the handling of the substances used. This makes the handling of these chemicals an unsafe act that implies a high risk for the population.

The assessment and prioritization of the health and safety risks identified during the visits are listed below.

Tillage activities for land preparation, planting, and harvesting:

- Mechanical: by the use of manual tools such as a hoe, shovel, rake, plow, and machete, among others. Also, tools such as scythes and chainsaws expose the worker to possible accidents due to their handling.
- Physical: due to exposure to hot-cold temperatures, non-ionizing radiation, noise, and vibrations from the use of scythes and chainsaws.
- Biomechanical: posture (prolonged, maintained, forced). Standing, kneeling, stooping. Overexertion and repetitive movements. hyperextension, extension, rotation, flexion of extremities.
- Safety conditions: local conditions due to uneven topography of the terrain. Wet and slippery floors due to mud. Slopes due to mountainous terrain.
- Psychosocial: work stress due to repetitive and monotonous work. Long working hours. Poor job stability and low economic remuneration.
- Biological: possible stings and bites from poisonous animals, insects, and rodents. Exposure to fungi and bacteria present in the land chosen for cultivation. Intoxication due to the presence of stinging or allergic plants.
- Natural phenomena: exposure of the worker to gales, landslides, precipitations due to the performance of tasks in open fields.

- Chemical: due to the use of chemical fertilizers in the preparation of the soil.
- Physical-chemical: due to the possible combustion or oxidation reaction that chemical substances could have when exposed to physical phenomena at the time of performing the task outdoors.

Coffee processing:

- Mechanical: due to the use of machinery and tools required in the process, such as pulping equipment (traditional pulper).
- Physical: due to exposure to hot-cold temperatures and non-ionizing radiation during washing and drying tasks.
- Biomechanical: posture (prolonged, maintained, forced). Standing, kneeling, stooping. Overexertion and repetitive movements. hyperextension, extension, rotation, flexion of extremities. Unfavorable movements for the body.
- Safety conditions due to lack of signage: clutter and lack of cleanliness, inadequate storage, faulty work areas, inadequate ladders and ramps, unsafe or defective scaffolding and roofs, and loads improperly stacked, or stored in an unsafe or irresponsible manner.

In the assessment of chemical risks, no use of personal protective equipment (PPE) for handling pesticides was detected. Nor was the use of adequate PPE to deal with biological risks detected. Chemical and biological hazards are the most frequently encountered and

are present in the tasks of clearing the land, plotting, plowing, hollowing, fertilizing the soil, preparing the seedbed, transplanting to the planting site, irrigation, fertilization, pruning, fumigation, harvesting coffee, pulping the fruit, fermentation, washing, drying, packaging, and transport.

Physical hazards tend to occur with a moderate frequency. Ergonomic and psychosocial hazards are less frequent, although there is no significant difference between them. Chemical and physicochemical hazards are also present, although in a very low proportion. This can be related to the results obtained by other authors (Toro-Osorio *et al.* 2017), where only 5.5 % of coffee growers have suffered some type of intoxication by pesticides in their working life, receiving medical treatment for it. Most of the intoxications suffered by farmers were with toxicity Ia, Ib, and II pesticides, which are the most toxic categories.

Regarding the prioritization of these hazards (Table 2), exposure to chemical agents (agrochemicals), physical agents (UV rays, humidity), incorrect and prolonged postures (ergonomics), are unacceptable risks that require urgent and immediate controls (values between 600-4000). The locative hazard due to irregular topography of the land is the highest risk, being unacceptable as second level (value of 300) and it is present in most tasks. Mechanical hazards due to the use of manual tools such as scythes and chainsaws and machines such as the pulper are rated as unacceptable first level risk (value of 1000) but only occur in three tasks of the process (cleaning the land, pruning, and pulping the fruit). It is also necessary to mention the danger of fire and explosion, which, although it has a rating of not acceptable first level risk (value of 1000), is present only in land clearing.

Table 2. Priorization of hazards found. Risk assessment according to GTC 45 (ICONTEC, 2012).

| Hazard | Risk value | Assessment |
|--------------------|------------|---|
| Chemical | 3000 | Critical situation, unacceptable, urgent correction. Risk level I |
| Physical agents | 2000 | Not acceptable, urgent correction. Risk level I |
| Ergonomics | 1500 | Not acceptable, urgent correction. Risk level I |
| Mechanical | 1000 | Not acceptable. Risk level I |
| Fire and explosion | 1000 | Not acceptable. Risk level I |
| Locative | 300 | Correct immediately. Risk level II |
| Biological agents | 120 | Improve existing control. Risk level III |

In general, the farmworkers do not consider their work dangerous. Due to their daily exposure, they have generated a false concept of security in risk management. This attitude is a serious obstacle to preventing and controlling the unacceptable risks detected in this work.

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REFERENCES

1. BULLOCK, W.H.; IGNACIO, J.S.; MULHAUSEN, J.R.; AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, AIHA. 2006. A strategy for assessing and managing occupational exposures. 3rd edition. AIHA Press. 349p.

2. GARZÓN DUQUE, M.O.; VÁSQUEZ TRESPALACIOS, E.M.; MOLINA VÁSQUEZ, J.; MUÑOZ GÓMEZ, S.G. 2017. Condiciones de trabajo, riesgos ergonómicos y presencia de desórdenes músculo-esqueléticos en recolectores de café de un municipio de Colombia. *Rev. Asoc. Esp. Espec. Med. Trab.* 26(2):127-136.
3. GÓMEZ YEPES, M.E.; CREMADES OLIVER, L.V. 2010. Condiciones de trabajo de los aplicadores de plaguicidas del área cafetera municipio de Calarcá, Departamento del Quindío - Colombia. VIII Congreso Internacional de Prevención de Riesgos Laborales (Valencia, España). 13p.
4. HURST, P.; TERMINE, P.; KARL, M. 2007. Trabajadores agrícolas y su contribución a la agricultura y el desarrollo rural sostenibles. Organización Internacional Del Trabajo-OIT; Organización De Las Naciones Unidas Para La Agricultura Y La Alimentación -FAO; Unión Internacional De Los Trabajadores De La Alimentación, Agrícolas, Hoteles, Restaurantes, Tabaco Y Afines-UITA. 108p. Available from Internet in: <http://www.fao.org/3/a-bp976s.pdf> (with access 19/02/2021).
5. INSTITUTO COLOMBIANO DE NORMAS TÉCNICAS Y CERTIFICACIÓN, ICONTEC. 1997. Norma técnica colombiana NTC 4114. Seguridad industrial. Realización de inspecciones planeadas. ICONTEC. 19p.
6. INSTITUTO COLOMBIANO DE NORMAS TÉCNICAS Y CERTIFICACIÓN, ICONTEC. 2012. Guía técnica colombiana GTC 45. Guía para la identificación de los peligros y la valoración de los riesgos en seguridad y salud ocupacional. ICONTEC. 36p.
7. JANKELOVA, N.; MASAR, D.; MORICOVA, S. 2017. Risk factors in the agriculture sector. *Agric. Econ. – Czech.* 63(6):247-258. <https://doi.org/10.17221/212/2016-AGRICECON>
8. LÓPEZ-ARAÚJO, B.; OSCA SEGOVIA, A. 2009. El papel del malestar físico y psicológico en los accidentes laborales en la agricultura. *Ansiedad y Estrés.* 15(2-3):249-261.
9. MINISTERIO DEL TRABAJO, MINTRABAJO. 2015. Decreto número 1072 de 2015. República de Colombia. 326p. Available from Internet in: <http://www.mintrabajo.gov.co/documents/20147/0/dur+sector+trabajo+actualizado+a+15+de+abril++de+2016pdf/a32b1dcf-7a4e-8a37-ac16-c121928719c8> (with access 19/02/2021).
10. OCAMPO, J.G.; OSLEY GARZON, M. 2016. El sistema de riesgos laborales frente al trabajador del sector informal. *Opin. Juríd.* 15(30):183-204. <https://doi.org/10.22395/ojum.v15n30a9>
11. ORGANIZACIÓN DE LAS NACIONES UNIDAS PARA LA ALIMENTACIÓN Y LA AGRICULTURA, FAO. 2022. Empleo rural decente. Condiciones de trabajo. Available from Internet in: <http://www.fao.org/rural-employment/work-areas/workin-g-conditions/es/> (with access on 17/02/2022).
12. OSORIO-QUINTERO, L.; LOPERA-GARCÍA, L.D.; LÓPEZ-ARANGO, Y.L.; RENDÓN-OSPINA, I.D.; TABARES-LÓPEZ, J.C.; MEDINA-TAMAYO, M.; NIETO-LÓPEZ, E. 2019. Condiciones de trabajo y de seguridad social en asociaciones de pequeños y medianos agricultores campesinos con prácticas de economía solidaria en tres municipios del oriente antioqueño, Colombia, 2015. *Rev. Fac. Nac. Salud Pública.* 37(2):36-48. <https://doi.org/10.17533/udea.rfnsp.v37n2a05>
13. PAISAJE CULTURAL CAFETERO. 2021. ¿Qué es el Paisaje Cultural Cafetero? Available from Internet in: <http://paisajeculturalcafetero.org.co/> (with access 19/02/2021).
14. TORO-OSORIO, B.M.; ROJAS-RODRÍGUEZ, A.E.; DÍAZ-ZAPATA, J.A. 2017. Niveles de colinesterasa sérica en caficultores del Departamento de Caldas, Colombia. *Revista de Salud Pública.* 19(3):318-324. <https://doi.org/10.15446/rsap.v19n3.52742>