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Research Article

Impacts of COVID-19 on Pest Management Activities in North Shoa, Central Ethiopia

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Abstract

Pest management is the most essential requirement for agricultural production, productivities, and crop market value in Ethiopia. However, nowadays the production, productivity, and market value of the crop are influenced by pests which resulted from the restriction of any social movement (transportation, physical approach, limitations of import and export commodity, and market) due to COVID-19 in Ethiopia. The study was assessed for pest management activities and its impact on fields of agriculture after Covid-19 introduced into the country Ethiopia and it was conducted in North shoa Oromia regional state in 2020. The assessment was laid out as purposively sampling methods that interviewed four hundred interviewees which include farmers, agricultural extension and hospitality were selected out of the five districts. As the interview, field, and market observation shows, the production and productivity were started to decline by 56 and 60 respectively. There were a number of crops like cereal (wheat and barley), Legume crop (faba bean and pea), and Vegetables (Onion and tomato) were infected by various pest populations. The outbreak of Covid-19 significantly influenced Crops, crop yields, and market values of agriculture which was resulted from weak pest management activities.

Keywords: Covid-19, Pest management, Pest, Pesticide, Agriculture

INTRODUCTION

Pest management is an important component of crop production and productivity in the worldwide. It is the mechanism of controlling by changing practices, making habitat alterations, and carefully using different mechanisms (chemical, Cultural, Mechanical, Biological, Physical and Integrated Pest Management to kill pests only when indicated and reached economic threshold level (Cyril Ehi-Eromosele, 2013). Pest control plays a crucial role in enabling essential businesses and organizations to provide safe products and services, prevent insect pests, weeds, nematode, rodents, disease outbreaks and reduce the risk of down time. Organisms generally attain pest status when their population increases to a level where it inflicts economic or aesthetic loss to human beings and as a result, the pest status of an organism will vary in time and space (Kathy D, 2016).

The sector of agriculture is the backbone of Ethiopia's economy which gives the basic ingredients to mankind and now raw material for industrialization, foreign exchange and food supply. It accounts for a large share of gross domestic product (GDP) (ranging from 30-60%), employs a huge proportion of the labor force (from 40-90%), represents a major source of foreign exchange, supplies the main parts of basic food and other income to more than half of the lower Developed Country's' population (Diriba W, 2018).

Agricultural growth and development leads to poverty reduction is not possible without using an appropriate pest management practices in addition to other management activities like, abiotic environments and market interconnection between the producers, Traders and beneficiary of the pesticides which were known as (Bactericides, Fungicides, Nematicides, rodenticides, herbicides) (Popp J et al., 2013). Within the limitations of these problems it is impossible to increase the incomes of

the producers and meet the interests of the consumers. Inappropriate pest management may cause the problems of imbalance between demand and supply, which is resulted from the problems of decrease agricultural productions and increase market instability (Popp J et al., 2013)

The strong interconnections within the rural sector and with other sectors of the economy provide added scale up growth and income generation of the country (Tewelde G et al., 2019). However, even if agriculture is the most or main source of income, foreign exchange, sources of cash, sources of food for both rural and urban area; due to this pandemic disease (Corona virus), the production and productivities of the crop begun to decrease (Bayeh M et al., 2016).

Ethiopia's agricultural productions were economically injured by many pests. Out of these pest populations, diseases like,(powdery mildew, chocolate spot, Faba bean gall disease, bacterial late blight, bacterial wilt, fusarium wilt, Onion white rot, damping off, Tomato mosaic virus and Maize strike virus), Insects like,(African bollworm, Aphids, white fly, Trips, Red teff worm, Grasp/chaffer grass, Grasshopper), Weeds like, striga, Broomrape, Mexican poppy, *parthenium hysterophores*, Amaranthus species, spiny cocklebur, cocklebur, Dodder, Morning glory, Cyprus species. Nematodes like, (root gall and seed gall) and other rodents like ants and mites are the major economic important pests.

It is known that the failure of production and productivities of the crop production resulted from the lack of recommended pest management and also shortages of agricultural input for pest management like pesticides (botanical, microbial and synthetic chemicals) due to its requirements of professional person to apply to different diseases, insects, nematodes and weeds within recommended doses by considering risks caused after inappropriate application doses (Pandiselvam R et al., 2020). Different pests controlled by different doses of pesticides. As example white fly was controlled by Nimbicidine400ml/ha, Aphids Agro-Lambacin Super 315 EC 488-976ml/ha, African bollworm Karate 5% EC* 5% EC Lamdex 5% EC 250-400ml/ha, powdery mildew Bayleton 50 WP 2500-3000ml/ha (Stephen Duke, 2017), farmers training for different improved varieties (resistance and tolerant crops), fertilizer which gives crop strength and immediate growth to escape critical stage of infestation, cultural input due to social distance during the declarations of state emergency.

Most of the Ethiopian societies have the habits of working in a group which is locally known as *dabo* (group of peoples collected in a specific field for working together like, for culturally managing and harvesting the crops) was now become punishable by the country's state emergency declaration, this in other way causes decrease in the values of productivities and increase chances of pest infestation. Generally when the country was lockdown any movements due to covid-19, the percentage pest infestation became increased and started to cross over the economic threshold level; especially for perishable crops like, fruits and vegetables due to the interruptions of chain between farmers, traders and consumers.

As a known pest infestations will delay the return of a building to normal yield obtained when the coronavirus lockdown restrictions are lifted. By using pest management services during this time, damage can be monitored and dealt with quickly and costs can be significantly reduced. But due to the outbreak of corona virus followed by declarations of state emergency, all industry, shops, social movement from rural to urban and from urban to rural were lockdown. These results the shortages of pesticides in rural area and decreasing numbers of peoples working together based on their indigenous knowledge to control the pests (cultural practices). Not only causes the shortage of pesticides but also it causes miss information in relation to pest management due to the absence of training given for the rural farmers by the agricultural sectors of extension. Thus this study was conducted to assess impacts of Covid-19 on pest management activities.

METHODOLOGY

Description of the Study Area

This study was conducted in North Shewa Zone of Oromia Region state, Ethiopia. It is bordered on the south by Oromia Special Zone Surrounding Addis Ababa, on the southwest by West Shewa, on the north by the Amhara Region, and on the southeast by East Shewa. Its absolute location is 9º15'N-10º15'0''N Latitude and 38º01'36''E-39º30'0''E longitude. Based on the 20017 Census conducted by the CSA of Ethiopia, this Zone had a total population of 1,431,305, of whom 717,552 were men and 713,753 women with an area of 10,322.48 square kilometres. It had a population density of 138.66.While 146,758 or 10.25% are urban inhabitants, a further 9 individuals were pastoralists. A total of 314,089 households were counted in this Zone, which results in an average of 4.56 persons to a household, and 303,609 housing units. For the purpose of this research, however five rural areas needed more briefing as the target areas of the study.

Sampling Methods

Population, sample size and Sampling technique: The targeted population of this study was active farmers, Traders, day laborers, formal and informal sectors, and household of the Rural available in the North Shoa Zone. Multistage sampling technique was used. First, based on the degree of rural' exposure to COVID-19, high interconnectivity among rural, high crop production and economic activities for crop productivity, and the location suitability of the rural to collect data, from total rural district selected in the study area, five districts(Girar-Jarso, Sheraro, Wera-Jarso, Hidebu Abote and Yaya-Gulale) were selected by using purposively sampling technique. Next, since the selected rural from which a

sample is to be drawn didn't constitute a homogeneous unit, stratified sampling technique was applied. Finally, systematic sampling technique was employed to select respondents proportionally from each stratum.

Accordingly, using sample size determination formula of (Adam AM, 2021), sample was drawn from total targeted population for questionnaire. The Sample size determination formula, which was used during the study.

$$n = \frac{N}{1 + N(e^2)}$$

Where n= sample size; N= number population; e is confidence level (95%).

$$\text{Samplesize} = \frac{1431305}{1 + 1431305(0.01^2)} \approx 400$$

Also, Based on the knowledgeable and experience they have on the sample unit and COVID-19, at zone level Agricultural office head, Transport sector, Finance and Economic cooperation, and Social and labor office head were purposively selected for Key informative interview. Besides this, at district level Agricultural office head, Agricultural extensions, Trade and industry head, Transport sector, Social and labor office head, COVID-19 task force were purposively selected for interview.

Data collection procedure: Before the beginning of data collection, researchers made contact with each selected rural village administrator to get permission, and baseline information; and well-designed survey questionnaire was prepared and then organized in a way that can capture all relevant information by employing face-to-face data collection techniques. Questionnaire had two parts: one, scenarios about the objective of this study and its expected output; second, labor, Pest management methods, crop production, harvesting, yield and food impact of COVID-19 related questions. Then orientation was provided for data collectors on the procedure they have to follow during data collection, on the objectives of the study, and on the items of questionnaires. Then, field work was started. The supervisors of this study moved to each rural to monitor, supervise and follow up the process on how data collection was on going. The researchers also interviewed principal district leaders, and Zonal key informative leaders.

RESULTS AND DISCUSSION

Assessments of Lockdown challenges on level of Pesticide applied/ha duringcovid-19

Shortages of pesticide used per hectare of land were caused during Covid-19 by (77.5%) when it was compared with pesticide used per hectare before Covid-19 **(Table 1).** This shortage resulted from the lockdown of any social movement and weak interconnection between farmers and professional extensions, who have knowledge about the pests and effective pesticides to treat the crops. According to most of the interviewee's opinion they have the fear of insect developing resistances to pesticides due to applications of low level pesticides/below the recommended rate to cover their field crop area by increasing volume of water per knapsack sprayer.

Table 1. Shortage of pesticide level/ha.

Category	(N=400)
Increase	77.50%
The same	9.20%
Decreased	13.30%
Total	100.00%

Table 2. Lockdown problems on labors for spraying pesticide.

Descriptive	percent number of respondent farmers and others
Category	(N=400)
Increase	9.50%
The same	21.50%
Decreased	69%
Total	100.00%

Challenges of lockdown on labors for spraying pesticide

Daily labor became decreased by (69%) when the country lockdown all activities due to fear of this pandemic disease **(Table 2)**. Pesticide application need sprayer (labor) especially in a developing country where shortage of different technological instruments for spraying pesticides like, Robot and other modern machine were difficult to use. So, in the study area all farmers use knapsack sprayer which take a time and need high human labors. This knapsack sprayers' capacity to hold water and other mixture is only fifteen to twenty (15-20) litters. Within this limited container one farmer may need to spray more than five hectare and also it may asks more than five laborers to cover the whole crops/fields per day. However due to this disease daily labor became difficult to obtain and personnel costs also increased which indirectly influence the cost benefit at the end.

Challenges of lockdown on harvesting

Harvesting problem became increased by (65.5%) after the outbreak of Covid-19 which increases additional pest infestation at field **(Table 3)**. Farmers in the study area still now follow traditional methods of harvesting based on the types of crops they cultivated. Among those traditional methods both animal and human drawn instruments were commonly used. So, these methods of harvesting need huge numbers of daily labor and it take a time. But state emergency restricts/ limits number of peoples working together by a group. According to the interviewees' opinion, they couldn't harvest their crops on a time due to transportation problems and limitations of number of labor working together.

Challenges of covid-19 on crop production during lockdown

Crop production loss increased by (56%) during the outbreak of Covid-19 which resulted from the lack of good pest managements **(Table 4** and **Figure 1)**.

Crop need necessary management methods both pre and post harvesting/at the field and after collected from the field up to reach in the hands of consumer especially perishable crops which need special protection from different factors like, disease, insects, rodents and weeds. But most of the crops matured during this period were lost due to the lockdown of transportation which interrupt the interconnection between farmers and traders, professional organization on crop managements and farmers. Due to lockdown some crops highly damaged at the fields before maturity and others were damaged after matured.

Table 3. Crop lost due to unable to harvest during lockdown.

Descriptive	percent number of respondent farmers and others
Category	(N=400)
Increase	65.50%
The same	29.40%
Decreased	5.10%
Total	100.00%

Table 4. Crop loss during lockdown.

Descriptive	percent number of respondent farmers and others
Category	(N=400)
Increase	56%
The same	33.50%
Decreased	10.50%
Total	100.00%

Figure1: Field of faba bean highly infected by two overlapped (chocolate spot and gall diseases) during the outbreak of corona virus.

Challenges of lockdown on yield

Loss of crop yields was increased by (60%) due to miss managements which resulted from the outbreak corona virus disease **(Table 5)**.Crop needs a good management to obtain expected output or good quality and quantities of yield at the end. But due to the outbreak of this pandemic disease which was followed by the declarations of state emergency, farmers couldn't manage their crops as it was become economic threshold to manage. This results low productivity/yield rather than the previous yield they obtained from the same land.

Challenges of lockdown on food

Shortage of food increased by (62%) during the outbreak of Corona virus which resulted from yield lost by pests **(Table 6)**. Most of the farmers' lives in the study area were depended only on farming and feeds their family results obtained from farm. So when the government of Ethiopia lockdown all activities, most people live in this study was failed down into the shortage of food due to crop damaged by different pests which resulted from lack of pest management.

Table 5. Yield lost due to lockdown.

Descriptive	percent number of respondent farmers and others
Category	(N=400)
Increase	60%
The same	31.20%
Decreased	8.80%
Total	100.00%

Table 6. Shortage of food caused due to lockdown.

Descriptive	percent number of respondent farmers and others
Category	(N=400)
Increase	62%
The same	32%
Decreased	6%
Total	100.00%

CONCLUSION AND RECOMMENDATIONS

Pest management refers mechanism of controlling all organisms which interfere with human activities and causes injure to crops. The livelihood of most Ethiopians depends on agriculture, the largest contributor to GDP and economic growth. The current COVID-19 pandemic severely causes impacts on agriculture and in fact most other economic sectors in Ethiopia. Generally this disease was cause failure in crop production and productivity due to lack of all materials necessary for good pest managements which

results changes on yield quantities and qualities.

Government and the media are required to aware and encourage the farmers to increase agricultural production during this bad time. All materials which are input for agricultural pest management should have to imported and distributed for the farmers by the government; because if farmers travel from one area to another for obtaining these input they increase spreads of disease from urban to rural. Farmers should have to be aware of how to protect themselves from the pandemic disease transmissions during pesticide applications and other methods of management.

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