Effects of Cashew Pests and Diseases during Different Production Stages and the Control Strategies Adopted in Tanzania

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Abstract
This study investigated the effects of cashew pests and diseases at different production stages and the strategies adopted to deal with the pests and diseases. In the effort to answer the research question, the study used both primary and secondary data. Primary data were collected using focus group discussions, interviews with key respondents, observations and a structured questionnaire completed by 120 cashew farmers in Tunduru district. Secondary data were obtained from written documents such as books and journal articles. It was revealed that cashew pests and diseases were very common during the flowering and leaf-shading stages of the cashew production cycle. The farmers used various methods to deal with the pests and diseases, including traditional methods like pruning and firing. The study recommends that more training in the right and sustainable methods of controlling cashew pests and diseases should be provided to cashew growers.

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Introduction

In sub-Saharan Africa, agriculture is vital to broad-based economic growth, poverty reduction and food security. The majority of Africans, especially those living in rural areas, mainly depend on agriculture for their livelihoods. Both cash and food crops are grown in different parts of the continent. Cash crops are grown in order to generate income. The income generated from cash-crop production in sub-Saharan Africa is much more essential in poverty reduction than in Gross Domestic product progression in other sectors (Chivandi et al., 2015 & Montero et al., 2017). Cashew has high economic value and about 40% of raw nuts are produced in Africa (Ah–You, Gagnevin & Joue, 2007). In Tanzania, cashew is the most highly produced cash crop. It accounts for 35.2% of cash crop production. It is followed by seed cotton (34.9%), coffee (10.4), tobacco (8.6%), tea (5.8) and sisal (5%).

Various cash crops are grown in different regions in the country; however, cashew is one of the significant export crops. The country has witnessed an increase in cashew production over the years. In 2015, cashew production stood at 0.155 million tons. The quantity increased to 0.233 million tons in 2019 (BoT, 2020). Cashew contributes to the GDP and is an essential source of livelihoods to smallholder farmers. For this reason, the cashew industry should be part of the sustainable development goals. The main cashew-producing regions in Tanzania include Mtwara, Lindi and Ruvuma. In Ruvuma, cashew is produced in Tunduru district. The three regions contribute more than 80% of the cashew produced in the country. In southern Tanzania, cashew farming is the main source of income for a number of households. The nuts are of vital importance as they contain 47% fat, 21% protein and 22% carbohydrate. The proteins found in the nuts have all the essential amino acids. It has been reported that a single kilogram of the nut yields about 6000 calories compared to 3600 calories from other cereals (Asogwa, Hammed & Ndubuaku, 2008). Residues of the cashew apple can be used to produce livestock feed.

Cashew as an export crop, its farming does not always translate into higher outputs per hectare in most developing countries. The comparatively limited productivity per hectare has been attributed to a number of constraints pertaining to different farming stages and to the technologies applied (Nyambo & Ligate, 2012; Dendena & Corsi, 2014). Pests and diseases are among the factors affecting the crop at different stages of the production cycle. Cashew is commonly regarded as a climate-resilient crop; however, it is affected by both biotic and abiotic factors. These factors intervene at particular stages of the crop production cycle. Cashew is the fourth most vulnerable export crop after coffee, cotton and tea in the country. Its quantity and quality are affected by biological factors, mainly cashew pests and diseases (Sijaona, 2002; Mitchell, 2004 & UNIDO, 2011). Several methods can be used to control cashew pests and diseases. Regrettably, data on cashew pests and diseases pertaining to different production stages and their control mechanisms are scarce in Tanzania. This study investigated the effects of cashew pests and diseases during different production stages and the control strategies adopted in Tunduru district.

Methods and Materials

The study was conducted in Tunduru district in Tanzania. The area was selected because of its involvement in cashew production. The nature of the environment and the climate of Tunduru district favor cashew production. The study used both quantitative and qualitative approaches in collecting the data. Three wards were randomly selected, namely Namasakata, Nalasi Mashariki and Lukumbule. Households were used as units of analysis and were selected using a stratified sampling technique. Forty households were selected from each ward and so a total of 120 households were involved in this study. Their selection was based on their involvement in cashew farming. Primary and secondary data were collected. Primary data were obtained using focus group discussions, interviews with key respondents, observations and a structured questionnaire completed by 120 cashew farmers in the district. Secondary data were obtained by reviewing documents, including books,

journal articles, and district and ward profiles, which provided background information on cashew pests and diseases.

Cashew Pests and Diseases in the Study Area

The prevalence of pests and diseases threatens agricultural production. Numerous diseases and pests were mentioned in the area where the study was conducted. The dominant diseases included powdery mildew (28.1%) and dieback (21.1%). The pests mentioned included cashew aphids (46.5%) and cashew mosquito bugs (42.9%). Several other studies on cashew pests and diseases (Maruthadurai et al., 2012; Nene, Makale and William, 2016; Mkumala 2017; Majune, Masawe and Mbega, 2018) have reported the existence of cashew pests and diseases in various parts of Tanzania. These pests and diseases are not comparable in all cashew production regions because of variations in weather and climate.

The Effects of Pests and Diseases at Cashew Production Stages

Cashew trees pass through different stages in the production cycle, including the shading stage, the flowering stage, the fruiting stage and the leaf-pruning stage. In most parts of Tanzania where cashew farming is undertaken, there are various cashew production stages. The pruning stage normally starts in April and ends in June, the shading stage is between June and July and between August and September the flowering stage starts. Cashew fruits normally begin to appear in September through December, a period followed by the period of harvesting cashew kernels. During the cashew production stages, cashew pests and diseases affect the crop differently, depending on climate variations.

Flowering and Leaf-shading Stage

The majority of respondents (85%) reported that, during the flowering stage, there were pests and diseases. Powderly mildew and mealy bugs common during this stage and can attack shoots, inflorescences, apples and nuts. The trees infected during the flowering stage normally do not produce fruits (see Table 1). A study done in India by Maruthadurai et al (2012) mentioned the mealy bug as a serious pest that affects cashew in all the cashew-growing areas in that country. They affect cashew trees during the flowering stage. A study done in Brazil by Freire et al (2002) had a different observation on the Powderly mildew disease, which was considered of lesser importance than dieback disease. Some 64.2% of the cashew farmers reported that there were high pest and disease infection rates during the leaf-shading stage. These results are contrary to those of Mkumala (2017) who reported moderate infections during the leaf-shading stage of the cashew production cycle. These differences are attributed to variations in location between the two areas as the pests and diseases that affect a certain area might not be common to all production areas.

Fruiting and Pruning Stage

About 66.7% of the cashew farmers reported moderate infections of pests and diseases during the fruiting stage. These findings are contrary to those of Martin et al. (1997), who reported high infection rates during the fruiting stage by Pseudotheraptus

wayi (coconut bugs) pests. The bug sucks on fruits, thus causing pockmarks. These differences are attributed to changes in climate over time. More scientific evidence shows an increased incidence of crop pests and diseases in diverse geographical locations as an outcome of changes in weather patterns (Shemsanga, Omambia & Gu, 2010; Malekela & Nyomora, 2019).

The majority of respondents (73.3%) explained that pests and diseases did not have any effect during the pruning stage because pruning enhanced ventilation in the plant, hence reducing the spread of pests and diseases. Some respondents (21.7 %) reported that pests and diseases had an insignificant effect during the pruning stage; pruning is normally done during the first 3-4 years. Pruning is one of the traditional methods of controlling cashew pests and diseases. During this stage it is very likely for cashew plants to be slightly affected. A study done in Indonesia by Jadid et al. (2017) mentioned pruning as one of the methods used to fight against cashew pests and diseases.

Table 1: Effects of Pests and Diseases during Cashew Production Stages

Cashew Production Cycle	Response	Frequency	Percent
Flowering stage	Slight	8	6.7
	Moderate	10	8.3
	High	102	85.0
	Total	**120**	**100.0**
Fruiting stage	None	2	1.7
	Slight	15	12.5
	Moderate	80	66.7
	High	23	19.2
	Total	**120**	**100.0**
Pruning stage	None	88	73.3
	Slight	26	21.7
	Moderate	5	4.2
	High	1	.8
	Total	**120**	**100.0**
Leaf-shading stage	None	1	.8
	Slight	16	13.3
	Moderate	26	21.7
	High	77	64.2
	Total	**120**	**100.0**

Cashew pests and diseases affected cashew kernels and apples. Some 98.3% of the respondents noticed changes on cashew kernels and apples, including crakes on cashew fruits (30.4%), the falling of young cashew (27.8%), the dying of both kernels and fruits at an early stage (21.1%) and rough skin on cashew kernels (20.8%). Coconut bugs can affect kernels (cause spots to appear on them); the spots lower their market value. Climatic changes, especially changes in the degree of temperature and rainfall, increase the number of pests and diseases that affect cashew kernels and apples. These results are similar to what was observed by Ghini, Bettiol and Hamada

(2011) and Balogoun et al. (2016) on the incidence of cashew pests and diseases in a changing climate.

Strategies for Controlling Cashew Pests and Diseases in the Study Area

In Africa, cashew farms are typically situated in humid areas with high pest pressure. This causes significant use of, and dependence on, pesticides over traditional methods of pest control. The majority of cashew farmers in Africa are smallholder farmers and most of them do not have sufficient knowledge of optimal ways of controlling pests and diseases. In the study area, farmers have adopted various strategies for controlling cashew pests and diseases. The majority of respondents (92.2%) employed various methods including the use of chemicals (46.7%) and traditional methods (41.8%). The chemicals and traditional methods adopted were used mostly than ecological control.

The Use of Chemicals

The use of chemicals is the most favored method of controlling pests and diseases. In the area where the study was done, different kinds of chemicals were used; however, the majority (72.5%) used powdery and liquid chemicals. A study by Vanitha and Saroj (2015) observed that cashew farmers used liquid chemicals to fight pests and diseases, but in Tunduru the famers commonly used powdery and liquid chemicals. Powdery chemicals were used because of the presence of a powdery mildew disease, which is common during the flowering stage. The disease causes yield losses by 70% to 100% and can be controlled using Sulphur (Sijaona, Reeder and Waller, 2009).

Most of the farmers used chemicals to control the pests. This method has certain side effects as it may reduce the number of valuable insects like innate enemies and prospective pollinators. The application of chemicals increases insects' resistance to insecticides and ecological contamination and affects the health of farmers, who normally lack the essential protective gear (Hill, 2000; NARI, 2010). The farmers (86.7%) bought the chemicals with their own savings; it was reported that the price of the chemicals was high. As a result, low-income farmers could not afford it as table 2 shows. The National Agricultural Policy of 1997 states that the pest and disease surveillance system and control mechanisms will be strengthened by the government. However, the respondents said they got very little support from the government for controlling pests and diseases.

Table 2: Chemicals Used to Control Pests and Diseases

Variable	Response	Frequency	Percent
Kinds of chemicals	Liquid chemicals	1	.8
	Powdery chemicals	32	26.7
	Both powdery and liquid chemicals	87	72.5
	Total	**120**	**100.0**
Means of chemical acquisition	Subsidies	6	5.0
	Individual savings	104	86.7
	Subsidies and individual savings	10	8.3

	Total	**120**	**100.0**
Price of chemicals	Expensive	115	95.8
	Moderate	5	4.2
	Total	**120**	**100.0**

Traditional Methods of Controlling Cashew Pests and Diseases

The farmers mentioned that they used various traditional methods to deal with the pests and diseases. Most of the respondents (63.7%) said they pruned their trees to fight pests and diseases. Even though this is a method which has been used for a long time, the farmers don't 'favour' it because they lack the right pruning skills. It is mentioned that trees need to be pruned at the node of the stem and the branch. This means that farmers need modern pruning techniques. Furthermore, 30.4% of the respondents said they used fire to control the pests. These findings are similar to those of Jadid et al. (2017), who reported that cashew farmers in Indonesia used traditional methods to control cashew pests and diseases.

Conclusion and Recommendations

This study investigated the effects of cashew pests and diseases during different cashew production stages and the control strategies adopted in Tunduru district. The study has revealed that different cashew pests and diseases affect the trees during the flowering, leaf-shading and fruiting stages, thereby reducing outputs in terms of quantity and quality. The farmers employed various methods, including the use of chemicals and traditional methods, to control the pests and diseases. The study recommends increasing the training provided to farmers so that they know and use the right and sustainable methods of controlling the pests and diseases in question. Finally, the government should provide support for dealing with such pests and diseases, as the National Agricultural Policy of 1997 says.

References

Ah-You, N., Gagnevin, L. & Joue, E. (2007). Pathological Variation within *Xanthomonascampestris* pv. *Mangiferaeindicae* Supports its Separation into Three Distinct Pathovars that can be Distinguished by Amplified Fragment Length Polymorphism. *Phytopathology*, 97(12): 1568–1577.

Asogwa, E. U., Hammed, L. A. & Ndubuaku, T. C. N. (2008). Integrated Production and Protection Practices of Cashew (Anacardium occidentale) in Nigeria. *African Journal of Biotechnology*, 7(25): 4868–4873.

Balogoun, I. et al. (2016). Effect of Climatic Factors on Cashew (Anacardium occidentale L.) Productivity in Benin (West Africa). *Journal of Earth Science Climate Change*, 7(1).

BoT (2020). *Bank of Tanzania Monthly Economic Review: Tanzania Cashew Production Zones*.https://www.tanzaniainvest.com/cashew.

Chivandi, E. et al. (2015). Potential of Indigenous Fruit-Bearing Trees to Curb Malnutrition; Improve Household Food Security, Income and Community Health in Sub-Saharan Africa: A Review. *Food Res. Int.* 76: 980–985.

Dendena, B., and Corsi, S. (2014). Cashew, from Seed to Market: A Review. *Agronomy and Sustainable Development*, 34: 753–772.

Freire, F. C. O. et al. (2002). Diseases of Cashew Nut Plants (Anacardium Occidentale L.) in Brazil. *Crop Protection*, 21:489–494.

Ghini, R., Bettiol, W. & Hamada, E. (2011). Diseases in Tropical and Plantation Crops as Affected by Climate Changes: Current Knowledge and Perspectives. *Plant Pathogen Journal*, 60: 122–132.

Hill, D. S. (2008). Pests of Crops in Warmer Climates and Their Control: Springer Science &Business Media, B.V. ISBN 978-1-4020-6737-2.

Jadid, N. et al. (2017). Traditional Pattern of Cashew Cultivation: A Lesson from Sumenep-Madura, Indonesia. AIP Conference Proceedings.

Majune, D. J., Masawe, P. A. & Mbega, R. E. (2018). Status and Management of Cashew Disease in Tanzania. *International Journal of Environment, Agriculture and Biotechnology*, 3(5).

Malekela, A. A. & Nyomora, M. S. **(**2019). Climate Change: Its Implications on Urban and Peri-urban Agriculture: A Case of Dar es Salaam City. Tanzania. *Science and Development*, 3: 40-53.

Martin, P. J. et al. (1997). Cashew Nut Production in Tanzania: Constraints and Progress through Integrated Crop Management. *Crop Protection*, 16: 5–14.

Maruthadurai, R. et al. (2012). Insect Pests of Cashew and their Management. Technical Bulletin No. 28, ICAR Research Complex for Goa, Old Goa.

Mitchell, D. (2004). Tanzania's Cashew Sector: Constraints and Challenges in a Global Environment. World Bank Africa Region Working Paper Series No. 70, June 2004.

Mkumala, S. (2017). The Influence of Climate Change on Cashew Nuts Pests and Diseases and the Adaptation Strategies Employed by Farmers: A Case of Mtwara District Southern Tanzania. Unpublished MSc. Dissertation, The University of Dodoma.

Montero, F. et al. (2017). Cashew as a High Agricultural Commodity in West Africa: Insights towards Sustainable Production in Guinea-Bissau. *Sustainability*, 9(9).

Naliendele Agricultural Research Institute (NARI). (2010). *Annual Cashew Research Report for 2009/2010*. Retrieved from Ministry of Agriculture, Livestock and Fisheries, Tanzania.

Nene, W. A., Makale, A. R. & William, M. (2016). Assessment of Awareness on Cashew Insect Pests, Diseases and Management Practices in Tanga Region, Tanzania. *International Journal of Science and Research*, V79(57).

Nyambo, B.,& Ligate, E. (2012). Smallholder Information Sources and Communication Pathways for Cashew Production and Marketing in Tanzania: An Ex-post Study in Tandahimba and Lindi Rural Districts,

Southern Tanzania. *The Journal of Agricultural Education and Extension*, 19(1): 73-92.

Osei-Akoto, S., Topper, C. P. & Swatson, E. (2005). Status of Cashew Production in Ghana and Agronomic Options for Increasing Production by Smallholder Farmers. Paper Presented at Ghana Institute of Horticulture Annual Conference, September 2005.

Shemsanga, C., Omambia, A. N. & Gu, Y. (2010). *The Cost of Climate Change in Tanzania: Impacts and Adaptations. Wuhan*. China: School of Environmental Studies, China University of Geosciences.

Sijaona, M. E. R. (2002). Assessment of the Situation and Development Prospects for the Cashew Nut Sector. Naliendele Agricultural Research Institute, Mtwara Tanzania.

Sijaona, M. E. R., Reeder, R. H. & Waller, J. M. (2009). New Rapport Cashew Leaf and Nut Blight: A New Disease of Cashew in Tanzania Caused by Cryptosporiopsis spp. *Plant Pathology*, 55(4).

United Nations Industrial Development Organization (UNIDO). (2011). *Tanzania's Cashew Value Chain: A Diagnostic*. Vienna, Austria.

Vanitha, K.,& Saroj, P. L. (2015). *Insect Pests of Cashew & their Management*. Technical Bulletin No. 27. Karnataka, India.