

JICA  
PM.36

JICA

**MUSHROOM PRODUCTION  
AN ANNOTATED BIBLIOGRAPHY  
OF LITERATURE  
AVAILABLE IN JAMAICA**

AGRINTER AGRIS

**IICA/JAMAICA**

**and**

**MINAG LIBRARY**

**Miscellaneous Publication #363**

**Series ISSN-0534-5391**

AN ANNOTATED BIBLIOGRAPHY  
OF LITERATURE  
AVAILABLE IN JAMAICA

1974

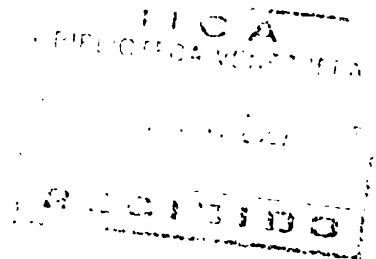
JAMAICA

1974

MIRAC LIBRARY  
Miscellaneous Publications = 303  
Series ISSN-0534-6391

MUSHROOM PRODUCTION  
AN ANNOTATED BIBLIOGRAPHY OF LITERATURE  
AVAILABLE IN JAMAICA

by



000000

SWARNA BANDARA (Ministry of Agriculture Library)  
SAMUEL BANDARA (University of the West Indies Library)  
IICA/Jamaica

September, 1982

**00000470**

## FORWARD

IICA Jamaica Office is happy to publish this currently available bibliography as a practical and usable tool. There is a vast store of information collected over the years in our local libraries that could, with this type of bibliography be utilized profitably by those who could put this information into practical use. In that sense this is a useful lead to literature that would otherwise remain locked away and unused. It is hoped that this will be the first in a series of similar 'keys' that will unlock the information of our libraries for users who have the need for such information. We welcome the work of Mr. and Mrs Bandara in our collection of papers "Agriculture in Jamaica"

Percy Altken-Soux  
Director



## INTRODUCTION

If available at a cost we could afford, many of us, we are sure, would like mushrooms in our menus. This item of food, although it could be produced in our environment without much difficulty, is not readily available in Jamaica. In 1967 and in 1969 an expert provided by the Food and Agriculture Organization (FAO) visited for two brief periods during which he carried out studies, surveyed the possibilities that exist here for the cultivation of mushrooms as a food crop, and made recommendations. The results of his investigations as well as guidelines he set out for cultivating mushrooms in Jamaica are contained in two reports submitted to the Government of Jamaica. In addition to those two documents specifically focusing attention on Jamaica (listed in this bibliography as items 23 and 24), a fairly large selection of literature on the subject is available in some of the libraries for the use of the nation. This, of course, should prove useful to anyone interested in attempting mushroom cultivation. As far as the compilers of this bibliography are aware none of the specialized journals dealing with mushroom culture as their particular interest such as: Mushroom Science and the Bulletin of the Mushroom Growers' Association are available in any of the Jamaican Libraries.

If those interested in mushroom production in Jamaica were to make a serious attempt to begin their cultivation, the literature that exists here within our libraries should be quite sufficient to provide them with the basic information required. The present bibliography is an attempt to bring to the attention of such persons a selection of this literature. If further specific questions were to be asked our libraries and their librarians could locate further items to answer such questions, and where the literature is not available on spot, the mechanisms exist to obtain it from elsewhere.

In the composition of the present list only the resources of two libraries in Kingston were searched and used. They are the Science Library of the University of the West Indies Library System, and the Ministry of Agriculture Library. Thus all items listed here are to be found in one or the other of those two libraries.

Brief annotations have been provided for each of the citations listed to assist the user in selecting items for consultation. The work by ROLF SINGER (item 36 in the present bibliography) has a lengthy bibliography which would be of use to anyone who wants further references to the literature to locate





readings for more detailed information.

This bibliography is offered as a contribution by two interested librarians who sincerely wish to see more use being made of the literature that is already available in our libraries for the use of our community. They also hope rather selfishly, that mushrooms will, one day be available in our local market within our reach so that we may enrich our tables with it.

S. Bandara (U.W.I.)

S. Bandara (MINAG)



1. ATKINS, Fred C.

Mushroom Growing Today. 4th ed. London, Faber and Faber, 1961, 186p.

Book organized in five sections: (1) the background to mushroom growing, (2) the technique of growing, (3) diseases and pests, (4) other aspects of mushroom growing, and (5) mushrooms as a sideline. This is a text dealing mainly with the cultivated white mushroom (Agaricus bisporus) and is directed at the reader who is interested in growing the crop in Britain. However it provides a fair amount of information that will be useful outside of Britain.

2. BAKER, J.A.

Mushroom Growing in Province Wellesley and Penang.

The Malayan Agricultural Journal. Vol. 22 (1934). pp.25-28.

Describes the cultivation of the padi straw mushroom Volvaria volvacea. Also presents a method of drying fresh mushrooms for preservation and convenience in marketing. Another interesting procedure given is that of obtaining spawn from a spent bed that is being broken up for establishing new beds - here given as sufficient spawn being collected from one bed that is being broken up to establish ten new beds.

3. CAYLEY, Dorothy M.

Spore and spore Germination in Wild and Cultivated Mushrooms (Psalliota spp). Transactions of the British Mycological Society. vol 20 (1936). pp.225-241.

Scientific account of spores and their germination in mushrooms. Pages 239-241 contain an appendix - 'Description of Two Forms of Cultivated Mushroom' by E.M. WAKEFIELD, describing the white and the brown varieties of the cultivated mushroom.

4. CHANG, Shu-Ting.

The Origin and Early Development of Straw Mushroom Cultivation. Economic Botany. Vol. 31, no.3 (July - Sept., 1977). pp374-376.

Discusses the early history of the padi straw mushroom with reference to



Chinese Literature. The origins of the cultivation of this mushroom is traced to the Nanhua Temple in the Kwangtung Province in China possibly before the 18th century.

5. CHANG, Shu-Ting and CHAN, Kit-Yock

Quantitative and Qualitative Changes in Proteins During Morphogenesis of the Basidiocarp of Volvariella volvacea. Mycologia. Vol. 65, no. 2 (March - April, 1973) pp. 355-364.

Describes the changes that take place in the proteins in the fruiting body of the mushroom as it develops through its various stages.

6. CHANG, Shu-Ting and YAH, Chung-Kei. Volvariella colcacea and its Life History. American Journal of Botany. Vol. 58, no.6 (July, 1976).pp.552-561.

This paper discusses the life history of the padi-straw mushroom based on its morphological, cytological and genetical characteristics.

7. CHUA, S.E. and HO, S.Y.

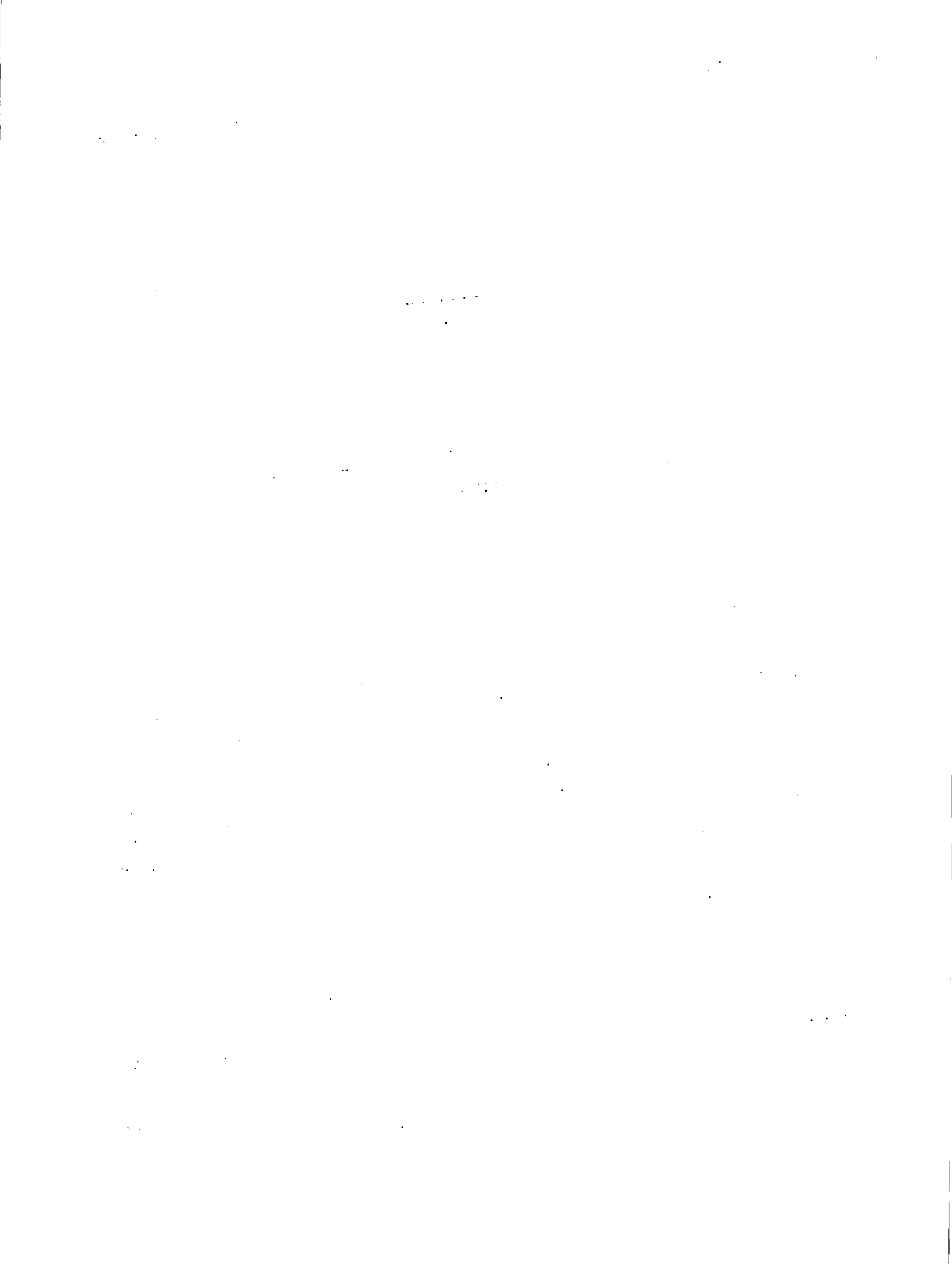
Fruiting on Sterile Agar and Cultivation of Straw Mushrooms (Volvariella volvacea) on Padi-Straw, Banana Leaves and Sawdust. World Crops. Vol 25, no.2 (March, April, 1973) pp.90-91.

An account of researches carried out at the Agricultural Division of the Department of Primary Production, Singapore. The discussion of Spawn production and cultivation is followed by an account of the results of experiments conducted showing that the straw-mushroom can be cultivated in sawdust and banana leaves besides the traditional padi-straw used as the basic substrate.

8. CLARA, Feliciano M.

Culture of Edible Mushrooms in the Philippines. Philippine Journal of Agriculture. Vol 8, (1937). pp.225-232. (Farmers' Circular No.28)

Essay on the production and use of spawn, construction of beds, and diseases. Deals with the padi-straw mushroom.



9. FERGUS, C.L., SINDEN, J.W., SCHISLER, L.C. and SIGEL, Edith M.

Possible Effect of *Pythium Astotrogus* on the Cultivated Mushroom.  
Phytopathology. Vol 53, no.11 (Nov., 1963). pp 1360-1362

10. FREAR, Donald, STYLER, J.F. and HALEY, D.E.

A Study of the Effect of H-ion Concentrate on the Growth of Agaricus campestris.- Plant Physiology. Vol. 3 (1928) pp. 91-94.

An account of an experiment conducted to determine the optimum H-ion concentrations for the growth of the mycelium of Agaris campestris, the common cultivated mushroom.

11. GO, LEONARDO K.

Experimental cultivation of *Volvaria volvacea* (Bulliard) Quelet. The Philippine Agriculturist.Vol. 43, no.7. (Dec., 1959) pp. 446-467.

Thesis presented for B.Sc. (Agriculture) degree at the College of Agriculture at the University of Philippines in 1959. Gives an account of the experiments carried out and results obtained at various stages in the growing of the padi-straw mushroom from the isolation of a pure culture through spawn production and growing.

12. GRAY, William D.

Fungi as a Food. Encyclopedia of Food Technology ed. by Arnold H. JOHNSON and Martin S. PETERSON. Westport, Connecticut, The AVI Publishing Co., 1974. pp. 472-475.

This is a general introduction to the use of mushrooms and other fungi as food, which includes brief notes on the cultivation of these as crops. Four species of mushroom, namely, the cultivated mushroom (Agarius bisporus) the padi-straw mushroom (Volvariella volvacea), the shitake (Lenzites edodes) and the Truffle (Tuber melanospermum) are considered here as varieties cultivated for food in sufficient quantities to warrant their being considered as food crops. Introductory notes are also included on the use of filamentous fungi in food processing, especially in cheese-making.





13. GROVES, J. Walton.

Edible and Poisonous Mushrooms of Canada. (with an Addendum by S.A. REDHEAD). Hull, Canadian Government Publishing Centre, 1979. x 326,p. (Agriculture Canada, Research Branch, Publication 1112).

Contains sections on 'Parts of a Mushroom' (pp.3-8), 'Food Value of Mushrooms' (p.11). Agaricus genera are dealt with on: pp.167-168.

14. HAYS, W.A. and NAIR, N.G.

The Cultivation of Agaricus bisporus and other Edible Mushrooms, in Filamentous Fungi. Vol. 1, Industrial Mycology ed. by John E. Smith and David R. Berry, London. E. Arnold, 1975.

Cultivation practices of the cultivated mushroom is the main interest of this contribution. There is a brief section on the Padi-straw mushroom on p. 237.

15. HOLLINGS, M.

Viruses Associated with a Die-back Disease of Cultivated Mushroom. Nature, Vol 196, no. 4858 (Dec. 8th, 1962) pp. 962-965.

Discusses disorders of the cultivated mushroom.

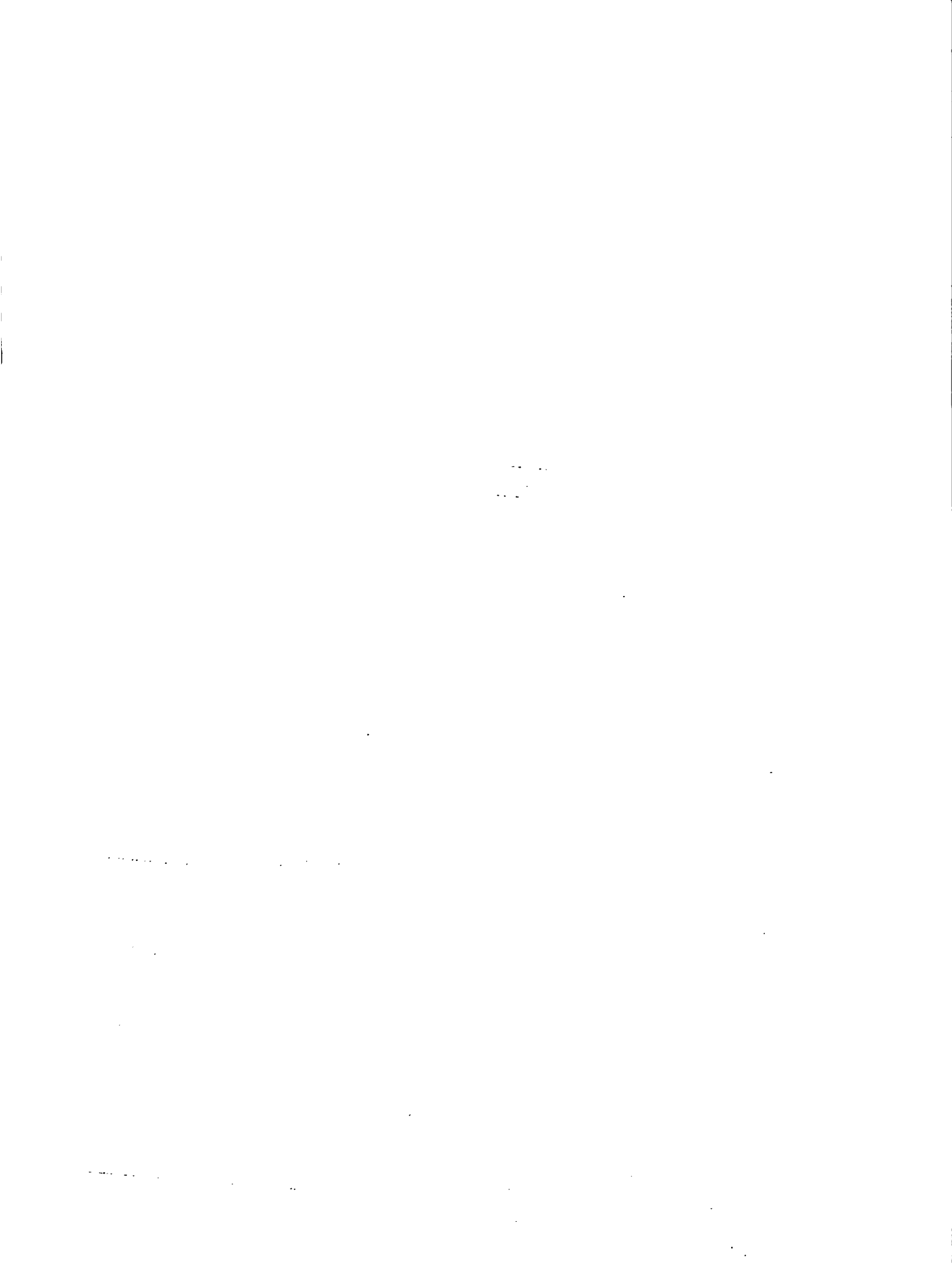
16. HOLLINGS, M. GANDY, Doreen G., and LAST., F.T.

A Virus Disease of a Fungus. Die-back of Cultivated Mushroom. Endeavour. Vol. 22, no. 87 (Sept., 1963) pp. 112-117.

Describes investigations in which viruses found to be the cause of disorders affecting mushroom crops were isolated. The disease investigated is named 'Die-back' by the authors, and they suspect that other disorders of the 'La France Group' (La France disease, infections watery, stipe, Brown Disease, and probably Mummy disease) are also caused by viruses.

17. HUSSEY, N.W. and WYATT, I.J. and HUGHES, J.T.

Insecticidal Control of Paedogenetic Cecid Larvae in Mushroom Beds: I Incorporation of Insecticides into compost. The Annals of Applied Biology. Vol. 48, no.2 (July 1960), pp. 336-346.



Investigation into the use of insecticides in controlling the infestation of mushroom beds by Cecid larvae that adversely affect crops by attacking the mycelium, by swarming onto mushrooms, or by disease transmission. This article discusses the effects of using insecticides in the compost.

18. HUSSEY, N.W. and WYATT, I.J.

Insecticidal Control of Paedogenetic Cecid Larvae in Mushroom Beds: II Incorporation of Insecticides in the Casing Layer. The Annals of Applied Biology. Vol. 48, no.2 (July 1960) pp. 347-351.

The same investigations as reported in item 17, but in this study the insecticide is applied into the casing layer rather than to the compost.

19. INGOLD, C.T.

The Nature of Toadstools. London, Edward Arnold, 1979. (4), 57 p.(The Institute of Biology's Studies in Biology. No. 113)

"The aim of this booklet is to give an account of certain of the larger fungi, namely mushrooms and toadstools"... "to describe their nature, to show how they work, and to indicate their importance in the economy of nature and to man himself". There is a section on mushroom cultivation ((pp.45-48) in chapter 6 entitled "Poisonous and edible toadstools and mushroom cultivation" dealing mainly with the cultivation of Agaricus bisporus.

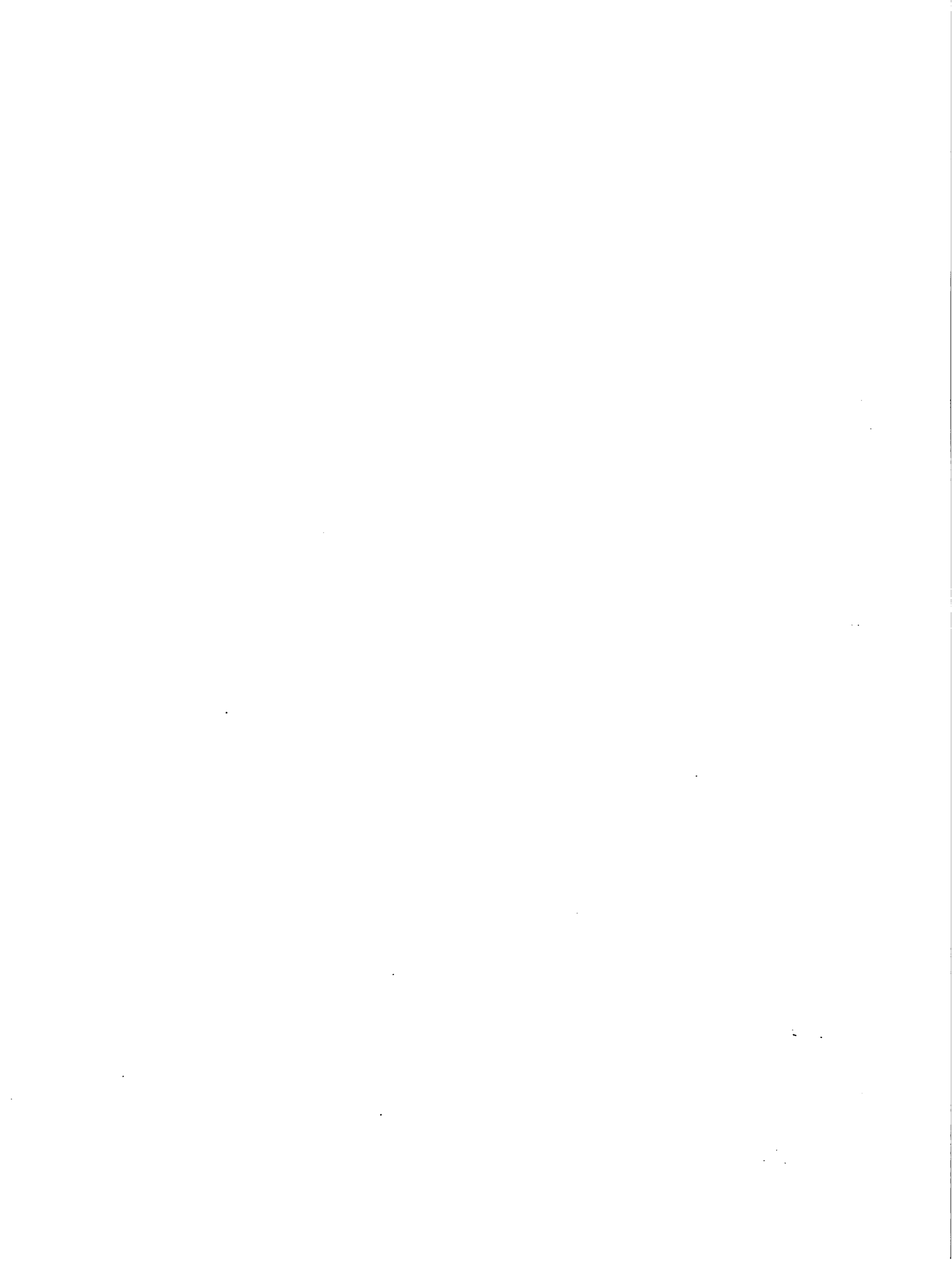
20. KLIGMAN, Albert M.

Some cultural and Genetic Problems in the Cultivation of the mushroom Agaricus Compestris Fr. American Journal of Botany Vol. 30, No.10 (Dec. 1943), 745-763.

This is a dissertation presented to the University of Pennsylvania in a partial fulfillment of the requirements for the degree of Doctor of Philosophy. An attempt is made to treat the general principles which underline the production of spawn.

21. KRIEGER, Louis C.C.

The Mushroom Handbook . Illustrated with photographs and drawings by the



author. New York, Dover Publications, 1967. viii, 560p.

This is the second edition of 'A Popular Guide to the Higher Fungi (Mushrooms) of New York State. (New York, The State University of New York, 1935.) Contains chapters on 'Life history and general characteristics of mushrooms' (pp.75-101), 'Economic importance of fungi' (pp.103-105), 'Common edible mushrooms with a section on recipes for cooking mushrooms' (pp.106-120) and 'Growing mushrooms' (pp.121-132)

22. LAMBERT, Edmund B.

Principles and Problems of Mushroom Culture. Botanical Reviews. Vol.4 (1938) pp. 397-426.

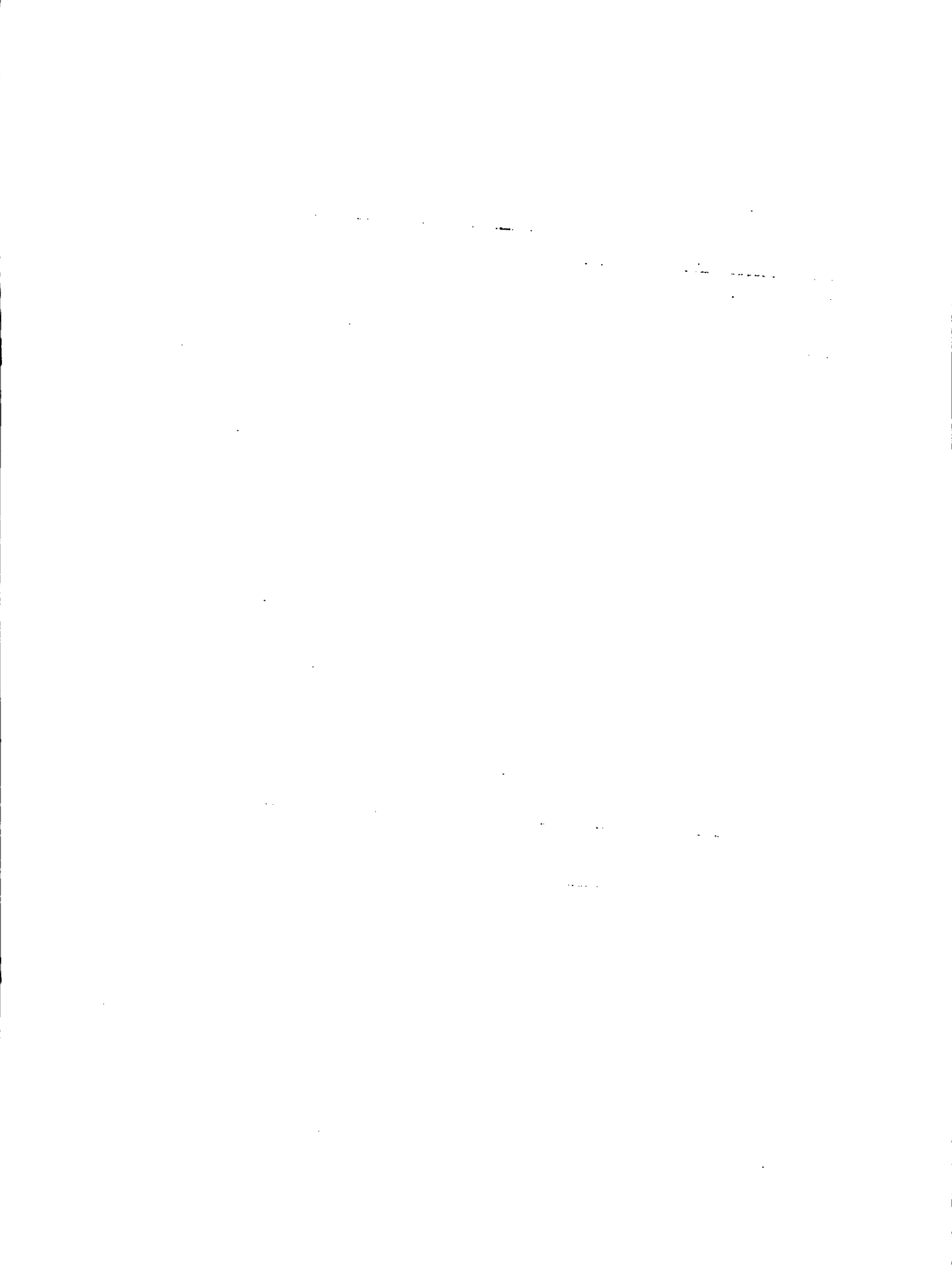
This essay discusses the life cycle, varieties, nuclear cycle, heredity, spawn making and spore germination, factors affecting the growth of the mycelium, compositing, diseases and insect pests, and, cultural practices, all of this mainly of the cultivated mushroom. Under a heading Other Cultivated Mushrooms (pp.417-20) a short section deals with Shiitake, Padi-straw Mushroom, Truffles and the Cultivation of new sorts.

23. MANTEL, E.F.K.

Report to the Government of Jamaica on Mushroom Cultivation. Rome, F.A.O., 1967. (2), 18p. (UNDP No. TA 2378 P.L.:TA/50)

Cover Title: Mushroom Cultivation)

Author served in Jamaica between 16th November and 16th January, 1967 as a Consultant advising the Government on all matters connected with the production of edible mushrooms, and assisting in a survey for the development of mushroom cultivation in the Island. This report contains an account of his activities with experiments and training of persons, and recommendations made after his period of surveying and experimentation. The experiments were carried out at the youth camps at Cobbla and Chester-ville. His recommendations include sections on the preparation of com-post, casing soil, mushroom production, and spawn cultivation. While the major part of the content of the report is on the cultivation of Agaricus bisporus, there is an appendix of "Instructions for growing tropical mushroom Volvaria displasia. A map of Jamaica showing 'Areas suitable for mushroom growing' is included.



24. MANTEL, E.F.K.

Report to the Government of Jamaica on Mushroom Cultivation (Report No.2) based on the Work of E.F.K. Mantel, FAO Mushroom Specialist. Rome, FAO, 1969. vi, 9p (UNDP No TA 2709, PL. TA/150). (Cover title: Mushroom Cultivation. (Report No.2).

Report of a second visit paid by Dr. Mantel during the period 26 April to 9 May 1969. When he was requested to review the progress made since his previous assignment and to advise the Government and private growers. Recommendations were made for a research programme to determine various formulae for mushroom composts, and also suggests the Botany Department of the U.W.I. take care of the cultures of Agaricus bisporus and Volvariella spp. Experiments are described and in Appendix 1 illustrations are contained for the preparation of compost in insulated containers. A second Appendix (p.9) gives instructions for growing the tropical mushroom Volvariella spp.

25. PIZER, N.H.

Investigation into the environment and nutrition of the cultivated mushroom Psalliota campestris. I. Some properties of composts in relation to the growth of the mycelium. The Journal of Agricultural Science. Vol 27, Part 3, (July 1937) pp.349-376.

An account of experiments conducted to investigate the influence of the physical or physico-chemical condition of the compost on mycelial growth. Reports the finding that the rate, strength and density of growth of the mycelium are controlled by the degree of dispersion of the compost.

26. PIZER, N.H. & THOMPSON A.J.

Investigations into the environment and nutrition of the cultivated mushroom (Psalliota campestris). II. The effect of calcium and phosphate on growth and productivity. The Journal of Agricultural Science. Vol. 28, Part 4, (Oct. 1938) pp. 604-617.

Describes 3 series of experiments carried out to determine the practical applications of the finding that the addition of small amounts of calcium and soluble phosphate to composts result in rapid and more vigorous mycelial growth. Discusses the results of the experiments.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial operations.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support informed decision-making.

3. The third part of the document focuses on the analysis and interpretation of the collected data. It discusses the various statistical and analytical tools used to identify trends, patterns, and anomalies in the data.

4. The fourth part of the document discusses the importance of communication and reporting in the context of data analysis. It emphasizes the need for clear and concise reports that effectively convey the findings and insights derived from the data.

5. The fifth part of the document discusses the challenges and limitations of data analysis. It highlights the need for careful consideration of the quality and reliability of the data, as well as the potential for bias and error in the analysis process.

6. The sixth part of the document discusses the future of data analysis and the role of emerging technologies. It highlights the potential of artificial intelligence, machine learning, and big data to revolutionize the way we collect, analyze, and interpret data.

7. The seventh part of the document discusses the ethical implications of data analysis. It emphasizes the need for transparency, accountability, and respect for individual privacy and data rights.

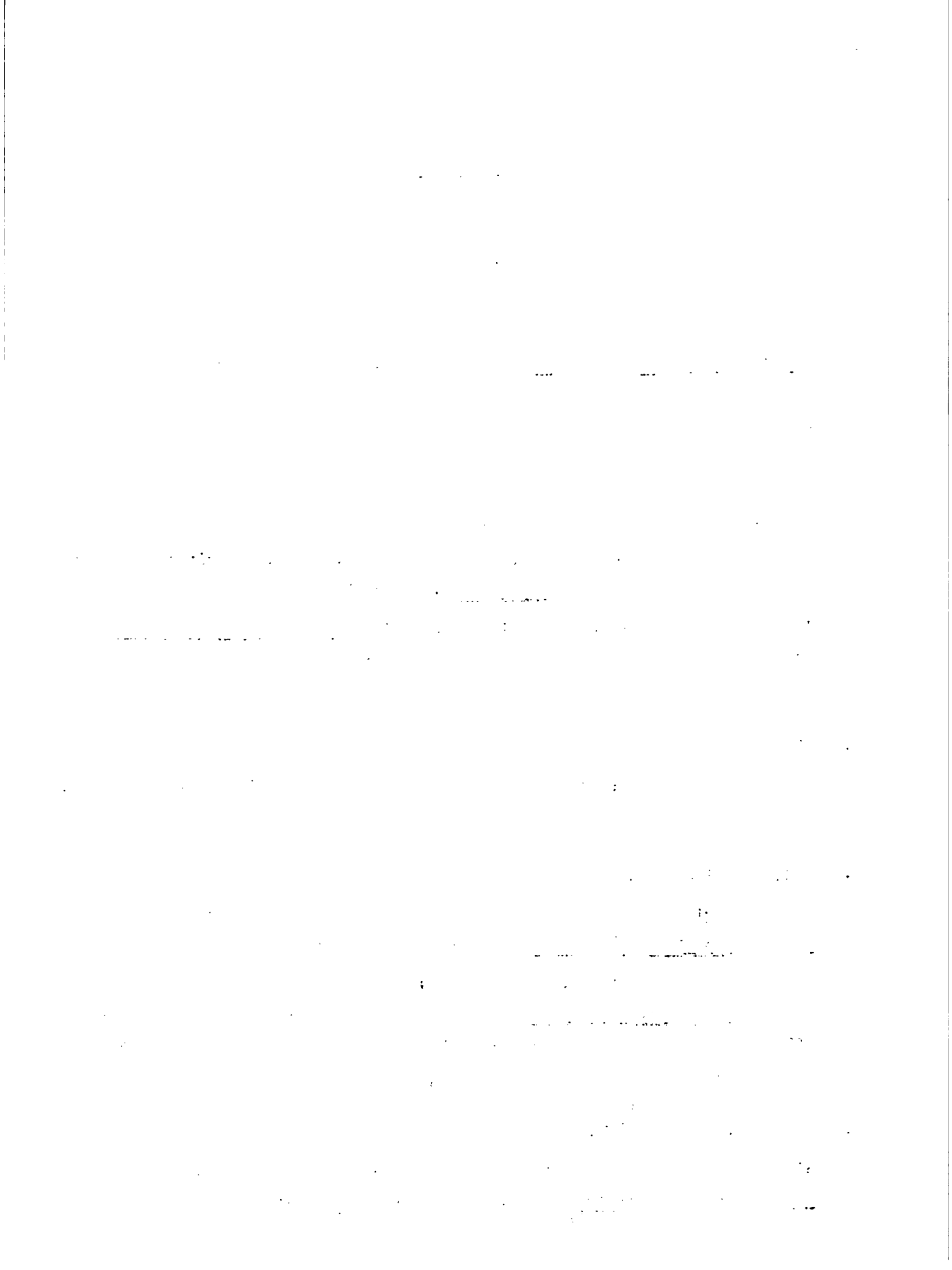
8. The eighth part of the document discusses the importance of data security and protection. It highlights the need for robust security measures to prevent data breaches and unauthorized access to sensitive information.

9. The ninth part of the document discusses the role of data analysis in various industries and sectors. It highlights the wide range of applications for data analysis, from healthcare and finance to marketing and social media.

10. The tenth part of the document discusses the importance of ongoing education and training in the field of data analysis. It emphasizes the need for professionals to stay up-to-date on the latest trends and technologies in the field.



27. RAMAGE, Hugh.  
Mushrooms - Mineral Content. Nature Vol.126, 3173, (23, August, 1930).  
p.279.  
Short communication on results obtained from spectrographic analysis  
of mushrooms for their mineral composition.
28. RICHARDS, A.A.  
Modern Mushroom Cultivation London, W.H. and L. Collingridge Ltd.,  
1954. 97p. ill.  
"The object of this book is primarily to help the beginner and the  
amateur."
29. SCHISLER, L.C., SINDEN J.W. and SIGEL, Edith M.  
Etiology, symptomatology, and epidemiology of a virus disease of cul-  
tivated mushrooms. Phytopathology. Vol. 57, No.5 (May 1967) pp.519-526.  
Investigations into the infectious diseases of Agaricus bisporus known  
under the names of La France disease, X-disease and die-back disease  
are discussed.
30. SCHISLER, L.C. SINDEN, J.W. and SIGEL, Edith M.  
Etiology of mummy disease of cultivated mushroom. Phytopathology Vol.58  
No. 7 (July 1968). pp. 944-948. ill.
31. SCHISLER, L.C. SINDEN, J.W."  
Nutrient Supplementation of mushroom compost at casing: vegetable oils.  
Canadian Journal of Botany.Vol.44, No. 8 (Aug.1966) pp. 1063-1069.  
Account of experiments and results showing increases of mushroom yield  
(of the Agaricus bisporus) related to the supplementation of the com-  
posts at casing with various ground seeds, and refined and crude seed  
oils.
32. SCHISLER, Lee C.  
Simulation of yield in the Cultivated Mushrooms by vegetable oils.  
Applied Microbiology.Vol. 15, No. 4 (July 1967) pp. 844-50.



In this contribution evidence is presented for a relationship between lipid metabolism and the initiating of fruiting in the cultivated mushroom.

Supplementing of the mushroom compost at spawning and at casing with various refined and crude seed oils is shown to result in increases in the yield. In the section on materials and methods a brief but clear account is given of the general method of mushroom culture.

33. SILVERIO, C.M. VILELA, L.C., GUILATCO, F.L. & HERNADNEZ, N.B.

Mushroom culture on enriched composted sawdust.

NSDB Technology Journal Vol. 6, No.4. (Oct. - Dec. 1981) pp.22-40. 111.

Account of investigations carried out on the cultivation of the mushroom Auricularia polytricha (ear fungus) using sawdust as the substrate with the use of organic and inorganic ingredients such as chicken manure, rice bran, urea, horse manure, ammonium sulphate, calcium carbonate, organic acid etc., to enrich the substrate. The list of citations given at the end of the paper, pp. 39-40 include a number of recent and older works relevant to the study of the cultivation of mushrooms.

34. SIMONS, Arthur J.

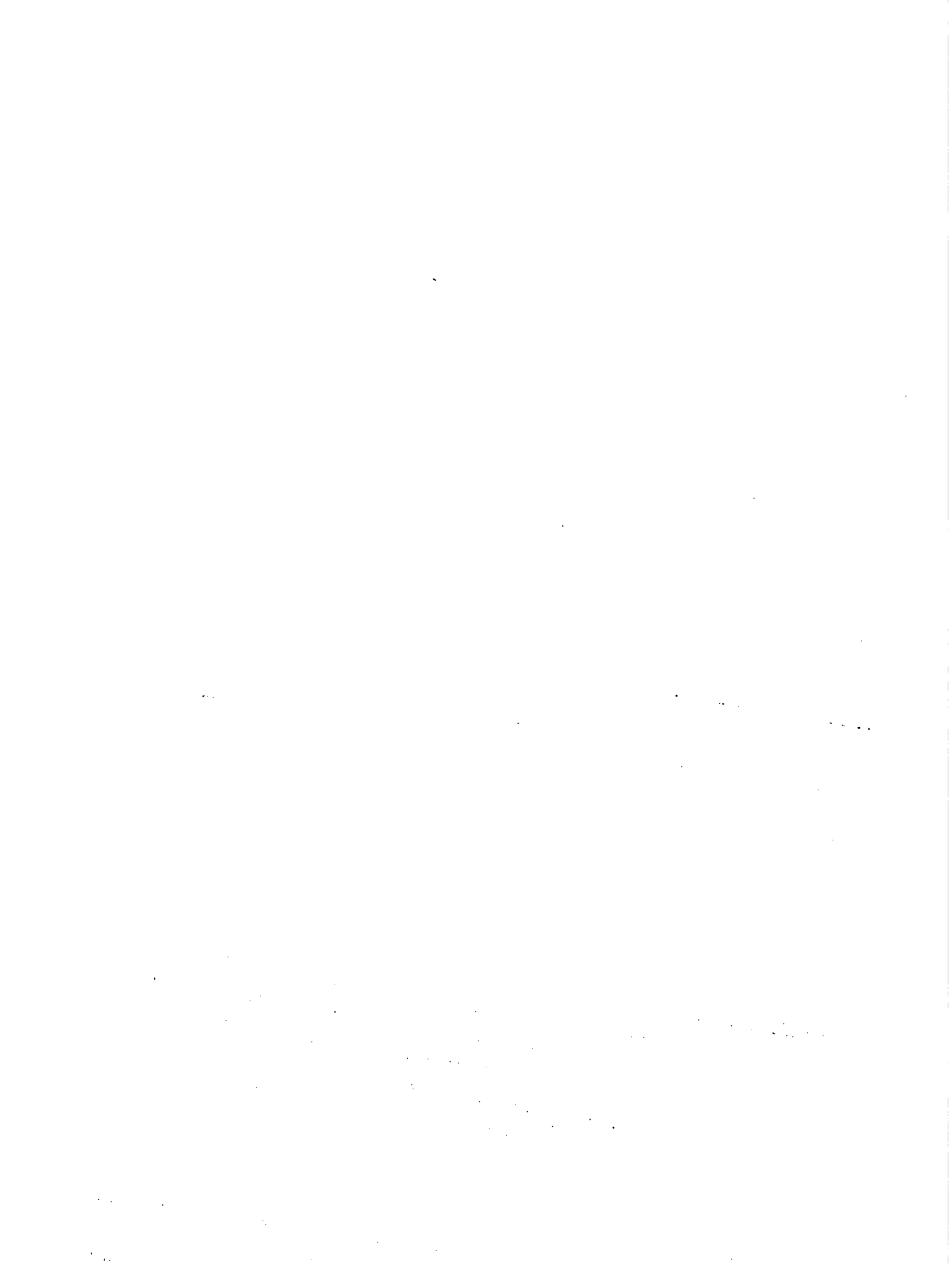
Mushroom Growing. New York, Drake Publishers, 1972. 96p.

This book is presented in two parts. In the introductory section (pp.9-22) dealing with wild mushrooms, the life cycle and the natural growth patterns are described. In Part II, entitled 'Cultivated Mushrooms' information on the processes, materials, growing, composting, substitute manures, management of beds, spawning, hygiene and harvesting of mushrooms are described.

35. SINDEN, James, W.

Ecology control of pathogens and weed-molds in Mushroom Culture. Annual Review of Phytopathology. Vol. 9, (1971). pp 411-432.

Pathogenes and weed-molds harmful to good production practices in mushroom culture are enemies that must be controlled by the cultivator. This essay gives a listing of pathogenes harmful to mushroom culture; nad also a table of weed-molds identified by fungus, common name, kind of growth,



effect on mushroom mycelium and relation to compost or soil (p. 420) and a lengthy account of how the control of these principal pathogens and weed-molds in a modern mushroom farm could be accomplished by a programme of environmental manipulation. As an introduction to the main essay an account of the development of mushroom culture including the present practices is provided.

36. SINGER, Rolf

Mushrooms and Truffles; Botany, Cultivation and Utilization London, Leonard Hill (Books) Ltd, 1969. xxxiv, 272 p., ill. (World Crops Books, Gen. ed: Nicholas Polunin).

One of the most detailed and comprehensive textbooks on the subject. The volume is arranged in such a way that while the cultivation of all the varieties of mushrooms - namely the cultivated white mushroom, the padi-straw mushroom, shiitake and truffles were covered, each one in turn is treated with an introductory section on the botany, followed by a descriptive account of the methods of cultivation with many details. In addition to a general introduction to the botany of mushrooms and truffles, there are chapters dealing with weeds, diseases, pests and uses of mushrooms as food and for other purposes. The value of the book is enhanced by the clear text figures and plates and the glossary of technical terms.

37. SMITH, Alexander, H.

Mushrooms in their Natural Habitats New York, Hafner Press, 1949. XIV, 626 p.

Author says in his Preface: "This work seemed to me to be the ideal opportunity to combine the advantages which can be obtained by a foray into the woods in the company of a specialist with the advantages inherent in a carefully prepared treatise..." The aim is to enable the reader to gain a lasting interest in fleshy fungi, a basic understanding of what they are and how they are classified and named, and to recognise a reasonably large number of species.



38. SMITH, F.E.V.

Three diseases of cultivated mushroom. Transactions of the British Mycological Society. Vol. 10. (1924), pp. 81-97. 111.

Three parasitic fungi that cause diseases in mushrooms are identified and the pathology of one of these, Mycogone perniciosa is investigated in detail. The observation is made that this fungus may be controlled by fumigation, or spraying with formalin or lysol or by soil sterilization.

39. STYLER, J. Franklin.

Preliminary study of the nutrition of the Cultivated Mushroom. American Journal of Botany. Vol. 15, (1928), pp. 246-250.

Results are recorded of a series of experimental cultures using a number of sugars and other organic compounds.

40. STYLER, J. Franklin.

Nutrition of the cultivated mushroom. American Journal of Botany Vol. 17. (1930). pp. 983

Account of a study conducted by observing the growth of the mycelium of the cultivated mushroom on simple media of known composition.

41. UDIPI, Shabha & PUNEKAR, B.D.

Nutritive value of mushrooms. Indian Journal of Medical Research. Vol. 72 (Aug. 1980) pp. 241-244.

Four species of mushrooms, namely: Agaricus bisporus, Arunillaria spp, Corpinus sp. and Pluteus sp. are examined for their nutritive values. They are analysed for proximate constituents, minerals and vitamins. In general these varieties were found to be good sources of proteins, phosphorous, iron and vitamins, but poor in fat, carbohydrates, calcium and vitamin C. All four varieties were found to compare favourably with food stuffs like beefmeal, yeast and soybean.

42. WAKSMAN, Selman A. & McGrath- J.M.

Preliminary study of chemical processes involved in the decomposition





of manure by Agaricus campestris American Journal of Botany. Vol 18 (1931) pp. 573-81.

43. WAKSMAN, Selman A. & NISSEN, W.

On the nutrition of the cultivated mushroom, Agaricus campestris, and the chemical changes brought about by this organism in the manure compost. American Journal of Botany. Vol. 19 (1932) pp. 514-537.

Studies conducted for the purpose of establishing changes brought about in the chemical composition of composts at various stages of the developments of the compost, and as a result of the growth of the mushroom.

44. WYATT, I.J.

The control of paedogenetic cecid larvae in mushroom beds by the use of thionazin. The Annals of Applied Botany. Vol 66, No.33 (Dec. 1970), pp. 497-504.

The record of an investigation similar to the one conducted by the author in collaboration with Hussy and Hughes (see above item 17 in this bibliography). In the present study the insecticide used is thionazin.

45. YAU, Chund-Kei & CHANG, Shu-Ting.

Cotton waste for indoor cultivation of straw mushroom

World Crops Vol 24, No.6 (Nov/Dec. 1972), pp. 302-303

Gives analysis of nutrient contents in the mushroom Volvariella Volvacea quoting work of LI, C.S. (1958) in Fukien Agricultural Journal. Vol. 8 (1958) pp. 18-23, as 2.68% protein, 2.24% fats, 0.91% ash, 2.60% sugars and 206.27 mg. vitamin C per 100g. fresh material.

This essay describes a new method for indoor cultivation of the padi-straw mushroom using cotton waste, and gives details for the preparation of the mushroom house, preparing the cotton waste, making up and the care of beds, harvesting and marketing.



## GLOSSARY OF SELECTED TERMS

- CASING** - In growing Agaricus bisporus when the spawned beds of compost have been left at the correct levels of temperature, moisture and ventilation for about 15-20 days, by which time the mycelium has grown sufficiently through the beds, the beds are covered or 'cased' with a thin layer of soil spread over the beds to cover the mycelium in order to induce the mycelium to produce a crop of fruiting bodies. The covering of the beds with such a layer of soil is referred to as 'casing', and the noun 'casing' is used also to refer to the cover or the layer of soil.
- COMPOST** - The substrate (or substratum) used for producing mushrooms is called the compost. For Agaricus bisporus the traditionally used compost consists mainly of horse manure mixed with straw bedding and soaked with urine which made to undergo a distinctive type of fermentation resulting in partial decomposition of the manure. The process of fermentation is referred to as 'composting'.
- CULTURE** - A growth obtained to begin a new cultivation cycle. In the case of Volvariella volvacea a common practice among many growers is to use mycelial cultures obtained from the 'spent'(used) straw from beds that have already produced a crop of mushrooms. Here the beds are cut up into pieces and used to spawn new beds. When this method is used the spawn so obtained is referred to as 'natural spawn'. Natural spawn is used where 'pure culture spawn' is not easily available. The more scientific method of using 'pure culture spawn' to begin a new cultivation is much superior. A 'pure culture' is so named because it is considered to consist of one individual strain only, and such a 'pure culture' is produced by securing a small portion of tissue from the fruiting body which is then made to grow on a medium. From this original culture sub-cultures can be obtained for producing spawn. The production of pure culture spawn requires laboratory facilities.
- FRUCTIFICATION** The act of producing 'fruiting-bodies' or the 'fruiting-body' itself. In the life cycle of the mushroom the growth of the mycelium in the substrate is followed by its producing a series of fruiting bodies or fructifications which form the 'crop'. The series of



fructifications are referred to as 'flushes' or 'breaks', and four of five such flushes could occur in each **crop** after which the compost will be spent and the beds will be abandoned. In the process of the fructification the appearance of the fruiting body could be observed in several stages. The mushroom (or fruiting body) first 'crops' out from the mycelium as a 'grain' referred to in scientific terminology as a 'primordium' and thereafter it grows into a 'button' which is a young fruiting body. The button matures into the 'mushroom' breaking the veil and opening out into the familiar mushroom shape, and thereafter it quickly deteriorates into an 'old fruiting body' by developing black spots, and gradually withers away. This cycle from the 'grain' to the 'old fruiting body' stage takes about three weeks. In mushroom growing the harvesting should be done during the 'button' stage just before the veil opens out completely.

**FRUITING  
BODY**

See **FRUCTIFICATION**

**MYCELIUM**

The vegetative phase of the fungus organism without fruiting bodies. In mushrooms this is generally an extensive web of microscopic filaments spreading inside the substrate and sometimes on its surface.

**PURE CULTURE**

See **CULTURE**

**SPAWN**

The mycelium of a fungi growing in its substrate and prepared for propagating mushroom producing strains.

**SPORE**

Reproductive cells produced in fruiting-bodies of fungi. These spores, although not the same as seeds in other plants, perform the same function as seeds in propagating their kind.

**SUBSTRATE**

(or **SUBSTRATUM**) The base on which the mycelium grows. In mushroom culture the substratum used is the compost on which the growth of the fungi is made to take place. See further: **COMPOST**.



## AGRICULTURE IN JAMAICA

### Collection of papers of the Office of IICA in Jamaica

#### 1977 - 1978

- No. I - 1 Fritz Andrew Sibbles, "Basic Agricultural Information on Jamaica Internal Document of Work", January 1977
- No. I - 2 Yvonne Lake, "Agricultural Planning in Jamaica", June 1977
- No. I - 3 Aston S. Wood, Ph. D., "Agricultural Education in Jamaica", September - October 1977
- No. I - 4 Uli Locher, "The Marketing of Agricultural Produce in Jamaica", November 1977
- No. I - 5 G. Barker, A. Wahab, L. A. Bell, "Agricultural Research in Jamaica", November 1977
- No. I - 6 Irving Johnson, Marie Strachan, Joseph Johnson, "Land Settlement in Jamaica", December 1977
- No. I - 7 Government of Jamaica, "Agricultural Government Policy Papers", February 1978
- No. I - 8 Jose Emilio Araujo, "The Communal Enterprise", February 1980
- No. I - 9 IICA and MOAJ, "Hillside Farming Technology - Intensive Short Course", Vols, I and II, March 1978
- No. I - 10 Jose Emilio Araujo, "The Theory Behind the Community Enterprise - Seminar in Jamaica", March 1978
- No. I - 11 Marie Strachan, "A National Programme for the Development of Hillside Farming in Jamaica", April 1978
- No. I - 12 D. D. Henry, "Brief Overall Diagnosis of Hillside Farming in Jamaica", April 1978
- No. I - 13 Neville Farquharson, "Production and Marketing of Yams in Allsides and Christiana", May 1978





(ii)

- No. I - 14 R. C. E. McDonald, A. H. Wahab, "Fertility Assessment of Newly Terraced Hillside Soils Using the Microplot Technique - the Allsides Case Study", 1978
- No. I - 15 IICA - IDB, "Course in Preparation and Evaluation of Agricultural Projects", Vols. I and II, November 1977
- No. I - 16 Neville Farquaharson, "Production and Marketing of Dasheen in Allsides and Christiana", June 1978

1978 - 1979

- No. II - 1 O. Arboleda-Sepulveda (IICA-CIDIA), "Agricultural Documentation and Information Network in Jamaica", September 1978
- No. II - 2 Victor Quiroga, "National Agricultural Information System", (NAIS-Jamaica) Project Profile, September 1978
- No. II - 3 Joseph Johnson, "A Review on Land Reform in Jamaica for the Period 1972 - 1978", September 1978
- No. II - 4 Neville Farquharson, "ABC of Vegetable Farming", A Draft High School Textbook, Vols. I, II, III and IV, February 1979
- No. II - 5 Jerry La Gra, "Elements of an Agricultural Marketing Strategy for Jamaica", March 1979
- No. II - 6 D. D. Henry, I. E. Johnson, "Agricultural Extension Service in Jamaica", March 1979

1979 - 1980

- No. III - 1 H. R. Stennett, "Watersheds of Jamaica and Considerations for an Ordinal Scale of Their Development", July 1979
- No. III - 2 IICA-MAJ, "Hillside Farming in Jamaica", A Training Seminar, December 1978
- No. III - 3 A. L. Wright, A. H. Wahab, H. Murray, "Performance of Six Varieties of Red Peas (*Phaseolus vulgaris* L.) on a Newly Terraced Ultisol in Jamaica", September 1979
- No. III - 4 IICA Jamaica Staff, "Agro-Socio-Economic Sample Survey of Allsides - Trelawny, Jamaica", September 1979



(iii)

- No. III - 5 IICA-MOAJ, "An Approach to Agricultural Settlement of Hilly Lands", October 1979
- No. III - 6 IICA-MOAJ, "Tree Crops of Economic Importance to Hillside Farms in Jamaica", October 1979
- No. III - 7 Canute McLean, "Production and Marketing of Peanuts", November 1979

1980

- No. IV - 1 Joseph Johnson, "Production and Marketing of Red Peas in the Hilly Areas of Jamaica", January 1980
- No. IV - 2 Lyn Snuffer, "Rural Women: An Annotated Caribbean Bibliography with special reference to Jamaica", January 1980
- No. IV - 3 Vincent Campbell, Abdul Wahab, Howard Murray, "Response of Peanut (Arachis hypogaea L.) on a Newly Terraced Ultisol in Jamaica", January 1980
- No. IV - 4 P. Aitken, A. Wahab, I. Johnson, A. Sahni, "Agro-Socio-Economic Survey - Pilot Hillside Agricultural Project 'PHILAGRIP' Southern Trelawny," February, 1980
- No. IV - 5 Glenys H. Barker, "Bibliography of Literature relating to Research and Development in the Agricultural Sector of Jamaica 1959 - 1979", March 1980
- No. IV - 6 Milton R. Wedderburn, "Allsides Farmers' Pre-Cooperative A Socio-Economic Assessment", March 1980
- No. IV - 7 Adele J. Wint, "The Role of Women in the Development Process", April 1980
- No. IV - 8 Milton R. Wedderburn, "The Co-operative Input in the Development of the Pilot Hillside Agricultural Project (PHILAGRIP)", April 1980
- No. IV - 9 MOJ/IICA/CARDI, Fruit Trees Seminar - "Research & Development of Fruit Trees", June 1980
- No. IV - 10 Henry Lancelot, "Traditional Systems in Hillside Farming, Upper Trelawny, Jamaica", June 1980



(iv)

- No. IV - 11 IICA/Jamaica, "Pilot Hillside Agricultural Project", (PHILAGRIP), Project Document. Vols. I, II and III, June 1980
- No. IV - 12 A. Wahab, I. Johnson, P. Aitken, H. Murray and H. Stennett, "Highlights of the Pilot Hillside Agricultural Project at Allsides", July 1980
- No. IV - 13 I. Johnson, A. Wahab, P. Aitken, H. Payne, "Benchmark for a Project Profile for Developing a Peanut Industry in Jamaica", July 1980
- No. IV - 14 P. Aitken, A. Wahab, I. Johnson, "The Allsides Post Peasant", August 1980
- No. IV - 15 Norma Munguia, Percy Aitken, Abdul Wahab, Irving Johnson, "Salt Extraction by Solar Energy", A Mini-project, September 1980
- No. IV - 16 Abdul H. Wahab, Percy Aitken-Soux, Irving E. Johnson and Howard Murray, "The Allsides Project in Jamaica - Developmental Potentials of Hillside Agriculture", September 1980
- No. IV - 17 P. Aitken, A. Wahab, I. Johnson, A. Sahney and N. Munguia, "Rural Women Survey", Vols. I, II and III, October 1980
- No. IV - 18 P. Aitken, I. E. Johnson, A. Wahab, "Assessment of Employment Among Small Hillside Farmers of Jamaica", November 1980
- No. IV - 19 IICA/Jamaica "Pilot Hillside Agricultural Project", (PHILAGRIP), Final Project Document. October 1980.
- No. IV - 20 P. Aitken, A. Wahab, I. E. Johnson, Bo-Myeong Woo, "IICA Evaluation of the First Phase FSB Allsides Project", (Internal Document of Work), November 1980
- No. IV - 21 MINAC/IICA/CARDI - "Seminar on Multiple Cropping", December 1980
- 1981
- No. V - 1 N. Munguia, P. Aitken, A. Wahab, I. Johnson, "Smoke Curing of Fish (as a household industry in Rural Jamaica)", January 1981



- No. V - 2 P. Aitken, A. Wahab, I. Johnson, "Under-employment - It's Relation to the Agricultural Sector and Considerations for its Management", January 1981
- No. V - 3 D. D. Henry, J. R. Gayle, "The Culture of Grafted Pimento (as spice crop for Allsides, Jamaica)", January 1981
- No. V - 4 Abdul H. Wahab, Noel Singh, "Agricultural Research in Jamaica", February 1981
- No. V - 5 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Country Level Action Plan (CLAP)", May 1981
- No. V - 6 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Overview of Agricultural Development in Jamaica", May 1981
- No. V - 7 Samuel Thompson, I. E. Johnson, P. Aitken-Soux, Abdul Wahab, "The Land Development & Utilization Act 1966", July 1981
- No. V - 8 Abdul Wahab, Percy Aitken-Soux, Irving Johnson, Bo-Myeong Woo, Howard Murray, Joseph Dehaney, "The Experiences of Jamaica in the Management of Agricultural Production on Hillsides", July 1981
- No. V - 9 Dave Hutton, Abdul Wahab, Howard Murray, "Yield Response of Yellow Yam (Dioscorea Cayenensis) After Disinfesting Planting Material of Pratylenchus Coffeae", July 1981
- No. V - 10 Elaine Montague-Gordon, Abdul H. Wahab, Joseph Dehaney and Audrey Wright, "Performance of Eleven Varieties of Dry Beans (Phaseolus vulgaris) Over Two Successive Seasons on the Hillsides of Jamaica", August 1981
- No. V - 11 Dave G. Hutton, Abdul H. Wahab, "Position Paper on Root Crops in Jamaica", August 1981
- No. V - 12 Percy Aitken-Soux, Abdul H. Wahab, Irving E. Johnson, "Technical Assistance for the English Speaking Caribbean (Considerations for an IICA Strategy)" (Internal Document of Work), September 1981
- No. V - 13 Bo-Myeong Woo, Abdul H. Wahab, Joseph Dehaney, "Crop Production on Hillsides using non-Bench Terracing Alternative Measures for Soil Conservation (first year's results of the Olive River Soil Conservation studies)", September 1981

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In the second section, the author details the various methods used to collect and analyze the data. This includes both manual and automated processes. The goal is to ensure that the data is as accurate and reliable as possible.

The third section provides a detailed breakdown of the results. It shows that there is a significant correlation between the variables being studied. This finding is supported by statistical analysis and is consistent with previous research in the field.

Finally, the document concludes with a series of recommendations for future research. It suggests that further studies should be conducted to explore the underlying causes of the observed trends. This will help to develop more effective strategies for addressing the issues at hand.



- No. V - 14 Abdul H. Wahab, Percy Aitken-Soux, Irving E. Johnson, Bo-Myeong Woo, Howard Murray and Joseph Dehaney, "Agricultural Production on Hillsides - the Allsides Project Case Study", September 1981
- No. V - 15 D. G. Hutton, A. H. Wahab and J. Dehaney, "Investigating Critical Levels of Dry Rotting of Yellow Yam (*Dioscorea Cayenensis*) Planting Material, the Benefits of Disinfesting the Heads of *Pratylenchus Coffeae* and of After-Planting Nematicide Treatments", September 1981
- No. V - 16 D. G. Hutton, A. H. Wahab, H. Murray and J. Dehaney, "Critical Levels of Dry Rotting of Yellow Yam (*Dioscorea Cayenensis*) Planting Material and Yield Responses After Disinfesting Heads of *Pratylenchus Coffeae* and After Post-Plant Nematicide Applications", September 1981
- No. V - 17 E. Ayer and J. Reyes, "Seminar on Mediterranean Fruit Fly", September 30, 1981
- No. V - 18 Bo-Myeong Woo, "Erosion Control Works in Korea", October 1981
- No. V - 19 Irving E. Johnson and Percy Aitken-Soux, "Country Level Action Plan (CLAP)" (Third Revision - Internal Document of Work), October 1981
- No. V - 20 Humberto Pizarro, "Programme of Work to Establish Guidelines for the Effective Administration, Operation and Maintenance of the Irrigation and Drainage District in the BRUMDEC Project" November 1981
- No. V - 21 Humberto Pizarro, "The Operation of the Drainage System in the Black River Upper Morass Project", November 1981
- No. V - 22 Humberto Pizarro, "Recommendations for Land Use and Irrigation Needs in the BRUMDEC Project", November 1981
- No. V - 23 Humberto Pizarro, "Organization, Operations and Maintenance of the Irrigation System in the BRUMDEC Project", November 1981
- No. V - 24 Humberto Pizarro, "Basic Information for Planning Water Management in the BRUMDEC Project", November 1981

1991

1992

1993

1994

1995

1996

1997

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

1982

- No. VI - 1 Vivian Chin, "Rice Research and Production in the BRUMDEC Project State-of-the-Art Review, Identification of Constraints and Interim Recommendations and Budget for Establishing 405 Hectares (1,000 acres) of Rice on the Clay Soils at BRUMDEC", January 1982
- No. VI - 2 Vivian Chin, "Programme of Work for the Short-Term Adaptive Production-Oriented Research on Rice in the BRUMDEC Project", January 1982
- No. VI - 3 Claude Grand-Pierre, "Adaptive Research for Grain Production (BRUMDEC) - A Short-Term Programme", January 1982
- No. VI - 4 Claude Grand-Pierre, "Experimental Procedures for Grain Crops Research in the BRUMDEC Project", January 1982
- No. VI - 5 Charles Kennard, "Summary of the Proposed Programme of Work for Adaptive Production Oriented Research (Short-Term) in Vegetable Production in the BRUMDEC Project", January 1982
- No. VI - 6 Charles Kennard, "Vegetable Production (BRUMDEC) - Review and Proposed Short-Term Adaptive Production Oriented Research Programme", January 1982
- No. VI - 7 Bo-Myeong Woo, "Olive River Run-Off Plots - Description of the Experiment", January 1982
- No. VI - 8 Vivian Chin, "Fertilizer Experiments in BRUMDEC (Second Quarterly Report)", January 1982
- No. VI - 9 Claude Grand-Pierre, "Third Quarterly Report of the Short Term Production Oriented Sorghum Research Programme", January 1982
- No. VI - 10 Bo Myeong Woo, Franklin Rosales, Abdul Wahab, Joseph Dehaney, Ministry of Agriculture, "Crop Production on Hillsides using Non-Bench Terracing Alternative Measures for Soil Conservation (Two year's results of the Olive River Soil Conservation Studies)", February 1982
- No. VI - 11 Philemon Hoilett, Ina Pyne, Calvin Gray, Renford Baker, and Michel Eldin, "Workshop on Agroclimatic Zoning - case study Kingston, Jamaica", April 1982
- No. VI - 12 Charles Kennard "Vegetable Production Programme - BRUMDEC Second Quarterly Report", Period December 19, 1981 to March 18, 1982, April 1982
- No. VI - 13 Claude Grand-Pierre, "Final Report on Grain Experimental Work in BRUMDEC" (Contract I), May 1982



- No. VI - 14 J.Y. Richmond, Ph.D., "Lab Safety Seminar - Animal Health - Conferences of Jonathan Richmond", June 1982
- No. VI - 15 Michael Wiles, "Freshwater Prawn (Shrimp) Culture for Jamaica - An Exploratory Report", June 1982
- No. VI - 16 Norma Munguia, Byron Lawrence, "Goat Revolving Scheme Project Model", Rural Women Project, July 1982
- No. VI - 17 Franklin E. Rosales, Ministry of Agriculture et al "Experimental Designs for Cassava-Peanut Production Systems", July 1982
- No. VI - 18 IICA/Jamaica, Samuel B. Bandara, "Institutions in the Agricultural Sector of Jamaica", (A Catalogue) Preliminary version, July 1982
- No. VI - 19 Charles Percy Kennard, "Vegetable Production Programme - BRUMDEC Third Quarterly Report", Period March 19th to June 18th, 1982 July 1982.
- No. VI - 20 Samuel Bandara, Swarna Bandara, "Mushroom Production, An Annotated Bibliography of Literature Available in Jamaica", September 1982





DOCUMENTO  
MICROFILMADO

7 JUL 1983

Fecha: .....