A QUANTITATIVE APPROACH TO PREDICT BEHAVIOURAL INTENTIONS TOWARDS ECOLOGICAL SANITATION: The Case of the co-composting of faecal sludge and solid wastes for urban agriculture project in Buobai.

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Declaration

I, Joyce Ekuful, hereby declare that the thesis on the topic:

A QUANTITATIVE APPROACH TO PREDICT BEHAVIOURAL INTENTIONS TOWARDS ECOLOGICAL SANITATION: The case of the co-composting of faecal sludge and solid wastes for urban agriculture in Buobai, Kumasi, Ghana,

is of my own work and that I have received no other assistance apart from the stated sources and citations.

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List of Abbreviations/Acronyms

EAWAG   Swiss Federal Institute for Aquatic Science and Technology

Ecosan   Ecological Sanitation

HAPA   Health Action Process Approach

HBM   Health Belief Models

IHE   International Hydrological Education

IWMI   International Water Management Institute

K   Potassium

Kg   Kilograms

KNUST   Kwame Nkrumah University of Science and Technology

MDGs   Millennium Development Goals

N   Nitrogen

NPK   Nitrogen, Phosphorus and Potassium

P   Phosphorous

PMT   Protection Motivation Theory

SANDEC   Department of Water and Sanitation in Developing Countries

SPSS   Statistical Package for the Social Sciences

SuSanA   Sustainable Sanitation Alliance

TRA   Theory of Reasoned Action

TPB   Theory of Planned behaviour

UDD   Urine Diverting Dehydrating

UK   United Kingdom

USA   United States of America

UNEP/GPA	United Nations Environmental Programme/Global Programme of Action
UNESCO	United Nations Educational, Scientific and Cultural Organisation

Key words

Ecological sanitation, Theory of Planned Behaviour, Intentions, Attitude, Quantitative, Awareness Creation

Abstract

Producing co-compost fertilizers from municipal solid wastes and human excreta is seen as one way of reducing the large volumes of wastes that are generated in the urban areas of Ghana. Since there are generally negative perceptions about wastes, the purpose of the study was to outline the factors that will determine the intentions of farmers to use the co-compost fertilizers in agriculture. To be able to identify the factors that predict intentions, the Theory of Planned Behaviour was applied. Based on this theory factors such as attitude, subjective norm and perceived behavioural control were assumed to be variables that predict the intentions of farmers towards the usage of the fertilizer.

Quantitative methods were employed in the primary data collection in Kumasi where an ecosan project is being implemented on a pilot phase and it took three months. Statistical Package for Social Sciences (SPSS) was used in the data analysis and specific tools such as descriptive statistics, reliability analysis and multiple regression were applied.

The result of the study revealed that all the three variables were significant determinants of the intentions of farmers to use the fertilizer. Specifically, attitude was the highest predictor whilst subjective norm was the least predictor. It was concluded that the farmers in this study sample consider their personal interest and feelings more than pressure from others to use the fertilizer. Therefore, more attention should be given to the attitude of the farmers in promoting the fertilizer. This can be done through sensitization programmes.

1. Introduction

Issues concerning hygiene, solid and liquid wastes disposal are very crucial in every society. These concepts come under a broader umbrella called sanitation which is defined as "a process whereby people demand, effect, and sustain a hygienic and healthy environment for themselves by erecting barriers to prevent the transmission of disease agents".[1] In that sense, sanitation is seen as a basis for healthy life of people in a society. Despite the fact that it is a basic need, many people find it difficult to have access it. Ghana like many developing countries, face a lot of challenges when it comes to sanitation which add up to the 2.6 million people worldwide without access to this basic need.[2] Sanitation related diseases have been a major cause of death in Ghana which calls for immediate intervention from all angles to ensure quality life. Ecological sanitation (ecosan) which is about re-use of wastes, introduced in the country as one way to help face these challenges needs thorough research to know how far people accept it for appropriate measures to be taken.

1.1. Problem statement and Justification

One negative implication of urbanisation in Ghana is poor sanitation due to the overburdening of the capacity of available facilities in relation to the number of people.[3] The population of Ghana for 2007 was estimated to be 22.4 million with an inter-census population growth rate of 2.7%.[4] 44% of the population were estimated in 2000 to be living in the urban areas and only 40% of them were having modest sanitation service coverage.[5] The urbanization has mainly been due to the concentration of industries, businesses, education and administrative functions in some part of the country. As people concentrate in the urban areas without sanitation facilities, they are compelled to dispose wastes anywhere. In situations where some facilities and waste management systems are provided, the large volumes of wastes generated make them inadequate. This ends up with negative effects on the health of the people. In Accra for example, sanitation-related diseases like diarrhoea, intestinal worms and cholera were recorded as the highest causes of death in 2005.[6] This is because most of the wastes end up in the lagoons, rivers and streams and moreover, people use inappropriate places like gutters,

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[1] Pfohl, Jake, 1997, p. 2.
[2] Sustainable Sanitation Alliance, 2008, p. 1.
[3] De Silva, 2007, p.31, who quoted from Allan, 1997
[4] Ghana Statistical service, 2008, pp.8-10
[5] Larbi, Eugene, 2006, p. 2.
[6] Morbidity for Accra Metropolitan Assembly

beaches and water courses as toilets which increase the level of pollution of water bodies.

Notwithstanding the problem of inadequate sanitation systems caused by urbanisation, culture and perception of people on wastes is other constraint hindering the provision of quality sanitation services in the country.[7] At the mention of some form of wastes, people frown their faces not expecting further discussion of that topic. The disposal of human waste (excrement) in particular is a subject normally buried in euphemism and avoidance-at least in public. This is in spite of the fact that it is part of life and every day, every human being on the average emits some amount of it. This euphemism makes experts to talk more about water-related diseases which are in actual fact related to sanitation.[8]

To solve the problem of inadequate systems, the new concept of ecosan is being implemented on pilot phases in the country.[9] Although this concept sounds convincing because it focuses on turning waste into a fertilizer and by that reduce the volume of wastes, it is important to assess intentions towards it. This is because of the existence of the second problem identified about perceptions and practices. For that matter, the Buobai co-composting pilot project in Kumasi is considered as case study for the behavioural intention prediction in this paper. This will help address the problem about perceptions identified and it will enable decision makers to predict if the intentions of the individuals relate positively to the new concept or not for appropriate measures to be taken. If the intentions are predicted to be positive, then can the concept be introduced to other rural and urban areas.

When ecosan is promoted, it will contribute to the improvement of soil fertility which will in turn increase the chances of more agricultural productivity hence food security; not leaving the main aim of improving access to basic sanitation. Consequently, effective social and economic development due to the availability of food and improved sanitation will contribute to the realisation of the Millennium Development Goals (MDGs) in general. It is important to mention here that since the concept of ecosan is new and it is still in the experimental stages, different names are given to the product based on the waste components used and other material added. All the same, for the

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[7] De Silva, 2007, pp.33-34, who quoted from Allan, 1997
[8] Black, Maggie; Fawcett, Ben, 2008, p. 3
[9] Larbi, Eugene, 2006, p. 5.

purpose of clarity, the term ecosan fertilizer will be used in this study to represent the fertilizer that is produced.

The general objective of the research is to outline the factors that determine the intentions to use ecosan fertilizer in agriculture by farmers. This will help to identify the factors that need to be considered in promoting ecosan. The specific objectives are:

- To predict if attitude influence intentions to use ecosan fertilizer

- To assess the extent to which subjective norm influence intentions to use ecosan fertilizer

- To predict if perceived behavioural control influence intentions to use ecosan fertilizer

The research question for the paper is; *what factors determine the intentions to use ecosan fertilizer in agriculture?*

1.2.   Overview of the rest of the paper

This rest of the paper is structured into five chapters. The next chapter which is chapter two highlights the theoretical framework. There, one may find the detailed description of some basic concepts, reviewed literatures on ecosan and elements and characteristics of the theory used. The chapter ends with the hypothesis of the research. Chapter three gives a detailed description of the case study with an overview of the project area and the preparation of the ecosan fertilizer are given. Chapter four focuses on the methodology where the needed data are specified and characterised. Moreover, one may find detailed description of the methods chosen for the data collection and processing. Chapter five shows the analysis and findings of the study. Chapter six gives the conclusion and recommendation to the paper. Apart from these main chapters, there is an annex where the questionnaire, field research plan and detailed Statistical Package for Social Sciences (SPSS) outputs are attached.

2. Theoretical Framework

2.1. Basic Definitions

For the purpose of easy understanding, some basic concepts which are fundamental to this paper need to be explained into detail. The concepts that will be explained in this section are ecology, sanitation, conventional sanitation and ecosan.

2.1.1. Ecology

Ecology is an aspect of biological science that deals with the relationship and interaction between living organisms and their surroundings.[10]It is also seen as "the scientific study of the distribution and abundance of organisms and the interactions that determine distribution and abundance".[11] To be more precise, it is the study of how the earth households work.[12] Ecology is explained further to include the exchange of materials and energy among the organisms which forms the ecosystem.[13] In the context of ecosan, ecology is seen to be agriculture. This is because ecology itself is an aspect of basic science that underlies the applied science of agriculture.[14] Distinction is normally created between ecological agriculture and conventional agriculture. Ecological agriculture refers to the agricultural practices that are sustainable and friendly to the environment where organic materials are used to enhance soil fertility and control pests, which is contrary to conventional agriculture where chemicals are used.[15] Ecological agriculture has been of significant interest in recent years and therefore calls for research and education.[16] This may be due to desires to reduce health problems which are caused by chemicals used in growing food and the aim of reducing volumes of organic wastes which are disposed in landfills. As one reads further, one may realise that ecological agriculture and ecological sanitation have similar definitions apart from the fact that they are named from different perspectives.

2.1.2. Sanitation

Sanitation has been defined differently by various authors and organisations to fit specific contest. It is understood to be the services and facilities required in ensuring a healthy, user friendly and convenient management of human wastes at the personal or

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[10] Nathanson, Jerry, 2000, p. 9.
[11] Townsend, Collin; Begon, Michael and Harper, John, 2008, p.4
[12] Capra, Fritjof, p.4.
[13] Nathanson, Jerry, 2000, p. 9.
[14] Weiner, Jacob, 1998, p. 3.
[15] Ibid, p.1.
[16] Ibid, p.3.

household level.[17] It is also seen as the water originating from wastewater including domestic, industrial sewage.[18] With these definitions, one can generally refer to sanitation as the management of wastes to prevent the outbreak of diseases and ensure sustainable environment. Waste which has been mention many time in this paper, "is the movable objects which the owner wishes to dispose of or whose controlled disposal is necessary to ensure the wellbeing of the general public and in particular the protection of the environment."[19] Despite its necessity, waste has always got a negative connotation that at the mention of it what comes to mind is garbage, rubbish or toxic material which is related the second problem discussed under the problem statement. However, one thing that one need to keep in mind is that waste does not vanish after disposal and for that matter what is regarded as wastes can be a resource in the future.[20] Therefore, any sanitation undertaking needs to secure concrete improvement in cleanliness in the disposal of wastes and in hygiene habit.[21]

There are four main components of sanitation and these are solid waste management, excreta management, grey water management and rain water management.[22] Solid waste management refers to the management of both degradable (bio-waste) and non-degradable wastes from households and communities. This involves their collection, transfer, transportation and disposal.[23] Excreta (faeces and urine) are the wastes produce as humans and animals remove non-useful materials from their systems and in terms of their flow system they are referred to as brown water for faeces and yellow water for urine. They are managed when they are disposed well. Grey water can be managed if the water from bathing and washing are treated for use without the addition of other liquids like urine.[24] Rain water management refers to the collection and storing of rainwater for future use. This paper for the purpose of the case study will focus on excreta and solid bio-waste.

2.1.3. Conventional sanitation and ecosan

Conventional sanitation refers to the traditional or normal sanitation management where the end results of the sanitation systems are not considered and so bring about health

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[17] UNEP/GPA-UNESCO-IHE-UN/DOALOS, 2004, p. 15.
[18] Pinnekamp, 2007, p. 6/1
[19] BMZ (1995), p. 289
[20] Dijkema, 2000, p. 634
[21] Arnold Pacey, 1980, p. 66.
[22] De Silva, 2007, p. 12.
[23] Kleiss, Torsten, 2008, p. 20
[24] Werner, Christen, et al 2003, p. 18

and environmental problems.[25] In excreta management for example, conventional sanitation can either be on-site sanitation systems like pit latrines or off-site systems like water closet which have central sewage treatment point but the end result which is not given proper attention brings negative consequences. In this modern era in most part of the world, the basic practice is to collect domestic liquid waste in water-borne sewer systems, treat them at a central point and then discharge the effluent into surface water bodies. In this practice, the downstream effects of the discharges are overlooked as most of the faecal sludge and other forms of wastes are not well treated.[26] These discharges end up polluting the water bodies which cause the outbreak of sanitation-related diseases. The vicious cycle of infections caused by the conventional approach is shown by figure 1 below.

Figure 1: Vicious cycle of infection
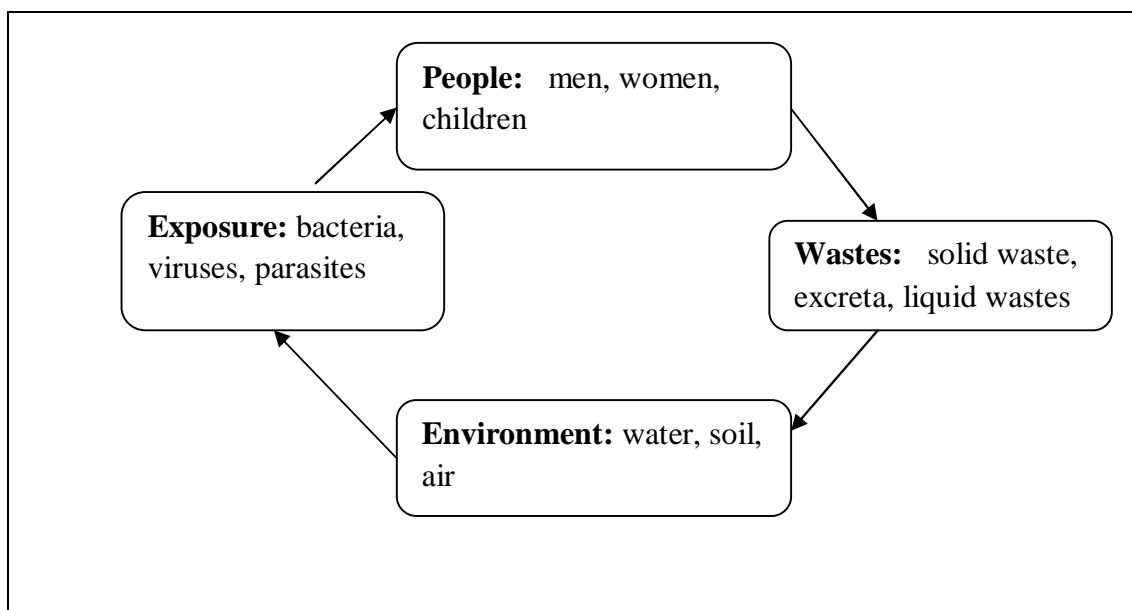
Source: Adapted from Esrey, Steven et al, 2001, p.9

Apart from the health implications, there are other global challenges which this conventional system of sanitation does nothing about. One can talk about the problem of water shortage where lack of freshwater for drinking is causing many deaths in most part of the world but the conventional practice of flushing toilet continue to waste more

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[25] Werner, Christen, et al 2003, p.10
[26] Panesar, Arne and Bischoff, Jürgen, 2008, p. 2.

of it. This makes the use of water for flushing to be even considered a crime.[27] In addition, one can mention the problem of food insecurity. Instead of retrieving the nutrient contained in the faecal sludge and other forms of wastes and treating them for re-use in agriculture, is overlooked in the conventional system. In the discussion about conventional agriculture, it became clear that, it is becoming less popular because of the presence of chemicals which affect health. Likewise conventional sanitation is also becoming less popular now because of its health implications and other current problems that it does not address. That is it is not sustainable. There is therefore a need for a paradigm shift to where health aspects will be taken from the holistic level and re-use sanitation approach will be emphasised.[28]

This shift calls for the destruction of pathogens (germs) through separation and treatment of wastes. Also, resources (water) should be conserved through a reduced use of potable water as a transport medium (flushing) for human excreta and recover wastewater for irrigation. Moreover, there is the need to close the resource loops through the productive use of the nutrients and energy (biogas) contained in excreta. Categorically, there are some sustainable criteria that need to be considered when this shift is being made and these include health and hygiene which involves the risk of exposure to pathogens and hazardous substances; environment and natural resources which involves the needed energy, water and other resources to operate the systems and how end result of the operation will be managed; technology and operation which is about the easiness in operating the entire system; financial and economic issues which is about the ability of the household and communities even in the grassroots level to afford the system; and lastly socio-cultural and institutional aspects which is concerned with the acceptance of the system.[29] The approach which is seen to take these criteria and concerns into consideration is (ecosan).[30] That is, it is a sustainable, non-polluting system based on recycling.

In reality, the principles of ecosan have been used for hundreds of years especially in many different cultures in East and South-East Asia in countries like China and Vietnam. Western countries largely abandoned the concept of ecosan for the conventional system thinking that it fitted modern lifestyle. However, with current

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[27] Pinnekamp, 2007, p. 5
[28] Panesar, Arner and Bischoff, Jürgen, 2008, p. 2.
[29] Arno, Rosemarin, et al, 2008, p. 20
[30] Ibid

realizations, the attraction towards ecosan is increasing.[31] Ecosan encompasses all systems that lead to sustainable sanitation and not specifically to one type of approach.[32] That is, all components of sanitation are inclusive in this new approach and they have their own ways of treatment for reuse either at the household level or in agriculture. Organic solid waste can be treated through composting or anaerobic digestion to form fertilizer. Rainwater can be treated through filtration or biological treatment to be supplied or for groundwater recharge. Grey water can be treated through constructed wetlands or wastewater ponds for irrigation. Faecal sludge can be treated through composting and drying to be used as fertilizer or anaerobic digestion for biogas. Lastly, urine can be treated through hygienisation by storing or drying it for liquid or dry fertilizer.[33] Figure 2 below shows how in ecosan, wastes can be treated for reuse and not released to pollute water bodies and the environment in general.

Figure 2:   Ecosan - closing the loop in wastewater management and sanitation

Source: Werner, Christen et al 2003, p. 17

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[31] Winblad, Uno and Simpson-Hébert, Mayling, 2004, p.7

[32] Vodounhessi, Anselme and Von Muench, Elisabeth, 2006, p. 1

[33] Werner, Christen et al 2003, p.18

Since faecal sludge is of great concern when it comes to ecosan because it is known to contain more pathogens as compared to urine, it is important to elaborate how these pathogens are killed to ensure safety. Some of the pathogens contained in faeces are bacteria, viruses, protozoa and helminths. They only affect public health when they get into the field or water bodies, or get to a person directly when the person does not wash the hand properly after visiting the toilet or drink water or eat food contaminated with them.[34] It was mentioned that faeces can be treated by composting and drying for fertilizer. These processes ensure increment in storage time, temperature, dryness, pH, ultraviolet radiation, and competing natural soil organisms which makes the survival of the pathogens impossible.[35] Most pathogens survive below temperatures of 5°C (degree Celsius) and die very quickly at high temperatures like above 40°C.[36] Due to that, as temperatures increases during composting and drying, most of them are killed. Considering the pH, it is argued that highly alkaline conditions renders the pathogens inactive and so this happens as alkaline is added during the process. In terms of ultraviolet radiations, it has been also observed that the presence of solar radiation reduce the survival time of the pathogens in the soil or on crops. When it comes to competing natural organisms, the presence of other organisms affecting each other by predation, release of antagonistic substances and competition for nutrients reduce the life-span of the pathogens. The pathogens are adapted to living in the gut of human beings and are therefore not able to compete well with organisms in the general environment. Moreover, these pathogens entering the environment are anaerobic and are easily overcome by the aerobic environment they find themselves.[37]

There are four broad categories of ecosan projects and these are rural upgrading, peri-urban (suburbs) and urban upgrading, new urban development and non-residential project.[38] The rural upgrading is a classical ecosan project where farming households in rural areas get support to establish the ecosan systems and then the households themselves handle the processing and use of the fertilizer (mainly excreta) in their farms. The peri-urban and urban project takes place in cities and towns where existing sanitation systems are converted into ecosan systems. In such cases, because of the

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[34] Strauss, Martin et al, 2003, p.3
[35] Winblad, Uno and Simpson-Hébert, Mayling, 2004, p.12
[36] Ibid
[37] Ibid
[38] Werner, Christine, et al 2003, pp. 21-23

difficulty of outright conversion, the ecosan solutions of reuse are built around the existing sanitation systems. Mostly in such project, it takes external service providers or the government to help in processing the fertilizers and sending them to farmers or to the reuse site. The new urban development is the type where new dwellings are built either by the government, private developers or the individuals in an ecological way. With that, all components of sanitation can be integrated in the construction and can either be the responsibility of the households or external service providers to handle the processing of the fertilizer. The non-residential project refers to ecosan systems in areas like schools, hospitals, hotels and offices. It can be in the form of upgrading or new development and the handling of the fertilizer may either be in the hands of the users or external service providers.[39] The project for consideration as case study in this paper is a peri-urban and urban upgrading project type, which is one of the few main ecosan projects in Ghana.

2.2. Some current studies about ecosan

Many studies have been made into ecological sanitation in recent years to assess its challenges and sustainability. Rose George[40] already discussed how some individuals fear that as people start focusing on nutrient recycling for growing food, they may forget about public health implications. This is because people may end up using the raw wastes without passing through the right processes. Moreover, it may be expensive for some households since they will need to change existing facilities if some types of ecosan projects like the rural, peri-urban and urban project types are to be implemented without external support; and even the fact that the fertilizer produced on commercial basis may be expensive.[41]

It was however indicated later that, those who support ecosan sees it to be better and it will require only persuasive techniques to make behaviour change towards it. To the supporters, in developing countries where the conventional flushing toilet system for example is not mostly available, can jump over to this advanced approach which is appropriate and sustainable. Supporting the argument about the jump towards ecosan, example is given of the situation where many people in developing countries without first getting the fixed line telephone systems, moved towards the usage of mobile phone

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[39] Werner, Christine, et al 2003, pp. 21-23
[40] George, Rose, 2008
[41] Ibid, pp. 231-234

which working well for them.[42] This argument shows that those who advocate ecosan see a future where instead of controlling pollution after it has happened, prevent it before it happens which goes with the saying "prevention is better than cure". In the subsequent paragraphs, some researches on ecosan with their findings will be discussed in relation to the objective of this study.

Urwibutso[43] undertook a study of sanitation issues in Rwanda and assessed the possibility of introducing some types of ecosan systems in a city called Kigali. The outcome of the study was that one type of ecosan toilet known as Diverting Dehydrating (UDD toilet) is an appropriate technology to be introduced in the area. However, one of the barriers to the introduction is socio-cultural beliefs against handling of human excreta.[44] This is because the UDD toilet is constructed in such a way that the urine can be separated from the faeces so that they can be treated separately for use. He therefore recommended that to ensure effective management, there will be a need for intensive education before implementation.[45] Although this study was more policy oriented in the sense that the researcher assessed the policies of government in the sanitation sector and what government could do to improve it in that country and not on predicting people's behavioural intentions towards ecological sanitation, it discovered a problem similar to the one identified in the research problem about perceptions and cultural practices.

One may say that some practices that exist in some part of Africa may not necessarily exist in all parts of the continent and that beliefs in Rwanda cannot used as bases of argument in Ghana. This may not be true because there are some studies done in Ghana which also mention similar problems. De Silva[46] in a research on multi-criteria analysis of options for urban sanitation and urban agriculture in Accra (Ghana) and Lima (Peru) analysed the advantages and disadvantages of various sanitation systems and toilet types as well as assessing problems associated with poor sanitation in Accra. He mentioned that culture and perceptions on public health were some of the constraint to sanitation provisions in the country.[47] This may hinder ecosan to play its role as it can be influential in achieving sustainable development.

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[42]George, Rose, 2008, pp. 231-234
[43] Urwibutso Noëlla, Joyeuse, 2008,
[44] Ibid, p.46
[45] Ibid
[46] De Silva, 2007
[47]De Silva, 2007, pp 12-34 and 52

In support of the point of De Silva, Geller and Laryea's paper on the ecological development of the Valley View University of Ghana which is a kind of ecosan project in Ghana also shows how the problem of perception exists in Ghana. They indicated that researches done on the project show that at the initial stage many workers reserve themselves in the collection, treatment, transportation and the application of the human wastes in the farms.[48] This may be due to the practices which they are used to. It was added that primarily, the attitudes of the workers towards the different components were not the same. For example, people felt more comfortable in handling urine as compared to the reuse of grey water and faecal sludge from septic tanks and so farmers from nearby villages demand the urine derived fertilisers and are willing to pay for the services.[49] Research showing farmers' demand for urine fertilizers and willingness to pay for services is economical and one may assume the farmers were more concerned to increase their profit.

Contrary to these arguments, Nkansah-Boadu's[50] research into socio-cultural and economic factors influencing faecal sludge use in agriculture in Manya Krobo district of Ghana realised that it is culturally acceptable to use human excreta in agriculture in the district.[51] It was realised that the non-users of the excreta, who were very few, were afraid of the risks involved because the excreta was used directly without any processing. Moreover, some of the non-users have less knowledge about it. The users on the other hand consider the agro-economic benefits and cheaper cost.[52] Analysing this study, one could say that the major factors that influence the use of wastes in this contest are the benefits and knowledge and the research placed much emphasis on agriculture and less on sanitation. All the same, the point raised here is supported by the paper of Olofunke Cofie and Kone Doulaye.

According to Cofie and Doulaye[53], researches done in the case of the co-composting of faecal sludge and solid wastes in Buobai from the farmers' perspective shows the majority of the farmers have positive perception of the project.[54] The farmers who were sceptical about the project feared that components of the human excreta can get into the

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[48] Geller and Laryea, 2008, p. 8
[49] Ibid
[50] Nkansah-Boadu, Frank, 2006
[51] Ibid, pp.53-73
[52] Ibid
[53] Olofunke, Cofie and Kone, Doulaye, 2008
[54] Ibid, p. 2

agricultural produce and also consumers may not be willing to buy produce fertilized with co-compost.[55] To be specific with what Cofie and Doulaye said an example is given based on the study of Danso et al[56] which focused on estimating the demand for municipal wastes via willingness-to-pay in Ghana. The study concentrated on three cities in Ghana namely Accra, Kumasi and Tamale. This research came with the findings that only 20% of the respondents expected the co-compost from the solid waste and excreta to be ineffective by considering health, cultural and religious consequences.[57]

Concerning the willingness to pay, the urban farmers in Kumasi were willing to pay less as compared with their counterparts in the peri-urban communities due to their access to free poultry manure. The situation was similar in Accra where the peri-urban farmers were willing to pay more. However, in the case of Tamale, the urban farmers were willing to pay more than the peri-urban farmers since their access to animal manure was limited.[58] Further analysis of the study showed that variables like perception, level of education, age, experience with compost and income levels were significant in determining the willingness to pay of the farmers. To market the co-compost, the research came to the conclusion that it will be more effective if the compost production is more subsidised so that farmers will be able to pay for the transport cost as well.[59]

The paper of Cofie and Doulaye with the study of Danso et al like that of Nkansa-Boadu, focused more on economic aspect which is different from the focus of this paper where the author want to outline factors that determine intentions towards the usage of the ecosan fertilizer which is from the socio-psychological point of view. Moreover, this research focus specifically on farmers who are aware of excreta based fertilizer but are not using it to determine if apart from the economic issues, other factors influence their willingness to use the ecosan fertilizer.

In relation to the determination of factors that influence the reuse of wastes as done by Danso et al, Ekere et al[60] undertook a study on factors that influence the separation and utilization of biodegradable wastes in the Lake Victoria Crescent in Uganda from the

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[55] Ibid

[56] Danso et al 2006

[57] Ibid, p. 1404

[58] Ibid, pp.1404-1405

[59] Ibid,

[60] Ekere, William; Mugisha, Johnny and Drake, Lars, 2009

household level. The study came out with the results that, factors like gender, area/size of plot, ownership of plot, location of plot and peer influence do determine the usage of wastes at the household level.[61]Gender was significant because utilization practice like compost need muscular strength. Also the larger the plot of land a household may have, the more they will need to use the wastes as fertilizer. In addition, people who belong to agricultural groups do get the influence to reuse their wastes and peri-urban locations reuse their wastes as compared to urban locations.[62]Although there are some similarities between this study and the study of the author of this paper, there are still some differences. This is because the study of Ekere et al was focus on the household level whilst this study focused on farmers.

From all these arguments, it is clear that at one point these is cultural and perception problem when it comes to the usage of wastes whiles at another point there is no problem that like. This still leaves the research question about what factors will determine the intentions of farmers to use ecosan fertilizer unanswered. The section below seeks to give theoretical explanations for behavioural intentions.

2.3.   Theoretical Explanations for behavioural intentions

To be able to assess the farmers' behavioural intentions towards this new approach (ecosan) which has bases on health and the prevention of diseases needs a theory on health behaviour. Behaviour has been defined to include a complex of observable and potentially measurable activities of responses.[63] Health behaviour theories help us to predict whether an individual will change the behaviour or maintain a status quo by considering some fundamental factors.[64]

There are two main groups of health behaviour theories (health beliefs and behaviour models) and these are cognitive models and social cognitive models.[65]Cognitive processes from where cognitive models originate, guide what and who one attend to, which information one keep in memory and how   one retrieve those information in judgement and evaluation which determine the behaviour of the individual.[66] Social cognition on the other hand introduces one to social interactions by first preparing and

[61] Ibid, pp. 3049-3050
[62]Ibid
[63] Bandura, Albert, 1969, p. 73.
[64] Schwarzer, Ralf 1992, p. 217.
[65] Ogden, Jane, 2007, pp. 23-24.
[66] Moskowitz, Gordon, 2005, p. 514

instructing the person on appropriate behaviours.[67] Cognitive models in the first place, assume that the individual being rational, evaluate the cost and benefit of a behaviour before making the intention to behave in a certain way.[68] Examples of cognitive models are Health Belief Model (HBM) and Protection Motivation Theory (PMT). The HBM which was developed in 1966 by Rosenstock, was initially to predict preventive health behaviours but now used in a wide range of health-related behaviours. The main components of HBM in the prediction are the individual's perception of his chances of attaining an illness, the severity of the sickness, the cost and benefit involved in carrying out a behaviour, cues for action, health motivation and perceived control.[69] PMT on the other hand, was developed as an expanded form of the health belief model by Rogers.[70] PMT is based on perceived severity of a disease, perceived vulnerability to illness, response effectiveness of a certain health action and self efficacy expectation towards a health action.[71] These cognitive theories have been criticised that they emphasis much on the individual and does not say anything on the role that the social and the economic environment play in predicting the behaviour of the individual.[72]

Social cognitive models based on the social context of cognition, analyses the factors that predict behaviour and assess why people refuse to maintain a particular behaviour to which they had initial commitment.[73] It is based on the conviction that principles and methods of information processing are important to explain complex social behaviours.[74] Social cognition theory was developed by Albert Bandura (1977, 1986) and predicted that behaviour is governed by expectancies, incentives and social cognitions.[75] Expectancies can be divided into three groups namely; situation outcome expectancies, outcome expectancies and self-efficacy. Incentives refer to the individual's perceived importance of an outcome of a behaviour and social cognition is where an individual represent the social world.[76] Many models and theories have been

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[67] Ibid
[68] Ogden, Jane, 2007, pp. 23-24
[69] Ibid
[70] Schwarzer, Ralf, 1992, p. 229
[71] Ibid
[72] . Ogden, Jane, 2007, pp. 26-29
[73] Ibid
[74] Pratkanis, Anthony; Breckler, Steven and Greenwald, Anthony, 1989, p.30-31
[75] Ogden, Jane, 2007, pp. 26-29
[76] Ibid

developed based on the social cognition models and they include the Health Action Process Approach (HAPA) and the Theory of Planned Behaviour (TPB).[77]

HAPA was developed by Ralf Schwarzer in 1992 as a review of all recent theories of health behaviour by incorporating all suggestions made in various literatures.[78] Much emphasis was placed on the central role played by self-efficacy which is about one's perceived control over intentions and behaviour, in predicting preventive actions, changing risky habits, and maintaining health-beneficial behaviours.[79] In discussing HAPA, a distinction was made between motivation stage where one takes a decision by considering the influencing factors and action stage in the process of behaviour change.[80] HAPA is criticised that despite its claim to be an improvement on other cognitive models, it still did not address the question about the exact role social and environmental factors play because it focused again on the individual's perception of the social world.[81] It is also criticised in addition to other stage models to be more difficult in practical application because of their complex structure and therefore need strong research design.[82]

TPB was developed by Icek Ajzen in 1988 based on a previous theory which he developed with his colleague Martin Fishbein called the Theory of Reasoned Action (TRA) in 1975.[83] According to Fishbein and Ajzen, TRA is based on the assumption that human beings are rational and they make good use of information available to them.[84] For that matter, they assess the implications of their actions before they make decisions. This assumption is considered as volitional (voluntary) control.[85] That is where the individual decide willingly by considering implication to perform a behaviour. There are two volitional controls or determinants of the individual's intention to behaviour and they are attitude towards the behaviour and subjective norm.[86] Ajzen alone later argued that it is not all behaviours that fall completely under these volitional controls but sometimes an additional factor called perceived behaviour

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[77] Ogden, Jane, 2007, pp. 29-30.
[78] Schwarzer, Ralf, 1992, pp. 232-238.
[79] Ibid
[80] Ibid.
[81] Ogden, Jane, 2007, p. 33.
[82] Conner, Mark and Normann, Paul, 2007, p. 265.
[83] Schwarzer, Ralf, 1992, p. 226.
[84] Ajzen, Icek and Fishbein, Martin, 1980, pp 5-6
[85] Ajzen, Icek and Fishbein, Martin, 1980, pp 5-6
[86] Ibid

control is applicable.[87] With this third determinant which is perceived behavioural control, TRA moves to TPB. The following sub-sections will be used to explain these determinants.

2.3.1. Attitude

Attitude has many definitions and descriptions because it is very important in studying human behaviour. It is described as a learned predisposition to respond favourably or unfavourably in a consistent manner to a given object.[88] It was also seen "to denote the sum total of a man's inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears, threats, and convictions about any specific topic."[89] It was defined simply by Bohner and Wänke as "a summary evaluation of an object of thought."[90]The object which is being mentioned by Bohner and Wänke, can be anything being it concrete or abstract that the person holds in mind.[91] Attitude includes the individual's personal evaluation of the positive and negative effect of a performance.[92] There have been arguments about attitude to be powerful in guiding perceptions, information processing and behaviour. This is because it is seen as having the power to structure one's social universe.[93] This may be due to the fact that it involves the evaluation of the consequences of a behaviour.

It is further argued however, that for attitude to influence behaviour, then it should be accessible. That is it should be activated from memory when the individual encounters the attitude object.[94] This argument originates from the point that due to cognitive processes, human beings keep any information that they receive and retrieve them where necessary. Attitudes, subjective norm and perceived behavioural control have some basic level explanations, which are classified as beliefs towards behaviour;[95]in the case of attitude, behavioural belief influences it towards the behaviour which makes the evaluation of the outcome possible.[96]Behavioural belief involves the perceived consequences of an act.[97]Allen gave an example that a person may give up eating

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[87] Ajzen, Icek,1988, pp 132-133

[88] Fishbein, Martin and Ajzen, Icek, 1975, p. 10.

[89] Thurstone, and Chave, 1929, P.7

[90] Bohner, Gerd and Wänke, Michaela, 2002, p.5

[91] Ibid

[92] Ajzen, Icek and Fishbein, Martin, 1980, pp 5-6

[93] Thurstone, and Chave, 1929, pp. 153-171

[94] Ibid

[95] Thurstone, and Chave, 1929, pp 122-134

[96] Ibid

[97] Eagly, Alice and Chaiken, Shelly, 1993, p. 169

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chocolate because that act will let the person lose weight and not simply stop eating chocolate without any reason. For that matter, a person may have positive attitude if the consequences are perceived to be positive.[98]To buttress this point, Schwarzer, added that behavioural beliefs can be replaced by outcome expectancies without changing the content, where the individual considers the cost and benefit to be derived from a behaviour.[99]

2.3.2. Subjective norm

Subjective norm refers to the social pressure put on the individual to perform or not to perform the behaviour.[100]It is also seen as one's belief about significant others or important people to the individual and their preference to one's engagement in a behaviour.[101] Subjective norm is a function of a person's belief of what others think he should do and the degree to which that person is being motivated to go by those beliefs. These beliefs are known as normative beliefs.[102]Normative belief influences the subjective norm involving the motivation to comply which could be social pressure to behave in a particular way. Thus, it represent the perceptions of significant others' preferences about whether one should engage in a behaviour or not.[103]Considering the argument of Bandura about expectancies, the normative beliefs can be translated into social outcome expectancies[104]where interest of others is considered.

Scholars do distinguish between descriptive norms and injunctive norms. Descriptive norm refers to the individual's perception of the behaviour of other people. For instance, if other people are doing something, then one may perceive it to be the right thing to do. Injunctive norm on the other hand like the explanation given to subjective norm, refers to the individual's perceived social pressure to behave in a particular way.[105] Emphasis will not be placed on this distinction since the study is not focused on that. One theory which is seen to enhance the relevance of subjective norm is the Self-Categorization Theory.[106]The self-categorization states that groups exist and they

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[98] Allen, F. 1998, p.60
[99] Schwarzer, R 1992, p. 228.
[100] Ajzen, I.; Fishbein, M. 1980, pp 5-6
[101] Eagly, Alice and Chaiken, Shelly, 1993, p. 169
[102] Allen, Felicity, 1998, pp.61and 171
[103] Ibid, p.171
[104] Ibid
[105] Fekadu, Zelalem and Kraft, Pal, 2002, pp. 34-35
[106] Ibid

influence behaviour when people are associated with them.[107]This self-categorization theory will also not be discussed in detail because group influence is not of much interest in this study.

2.3.3. Perceived Behavioural Control

The perceived behaviour control "refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles."[108]The basic explanation that determines perceived behavioural control is control beliefs where control belief influences the perception of behavioural control involving both internal and external factors.[109] The internal factors can be knowledge about the behaviour and the external factors may involve the availability of resources like equipment and machinery to be used as one engages in the behaviour. Perceived behavioural control affect behaviour in two ways: it influences intentions to perform the behaviour and it can influence behaviour directly.[110]It is explained further that when it comes to direct influence of control on behaviour what is relevant is actual control as in availability of resources and opportunities and not entirely perceived control as in knowledge alone which may not be fully adequate.[111] In this domain as well, perceived behaviour control can be replaced with self-efficacy expectation where the individual considers the capability to behave in a particular way. Doing that linkage strengthens the argument that TPB is a social cognitive model as its characteristics fit into those identified by Bandura.

2.3.4. Behavioural Intentions

The issue of planning and forethought is very crucial when it comes to behavioural intentions. An intention is a psychological construct which represent ones motivation in a conscious plan to force the performance of a behaviour.[112]The concept of intentions was introduced during the debate about attitude-behaviour relationship by saying that attitude influence behaviour by their influence on intentions as one decide to act on a particular way.[113] Attitude at a point was seen to influence behaviour directly and even sometimes used in place of behaviour but this distinction introduced with the

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[107] Moreland, Richard.
[108]Eagly, Alice and Chaiken, Shelly, 1993, p. 187
[109]Ibid
[110] Ibid
[111] Ibid
[112] Eagly, Alice and Chaiken, Shelly, 1993, p. 168
[113] Ibid

explanation of intentions, makes things clearer. It shows that for attitude to influence behaviour, it should first influence the intentions. From the other explanations given to subjective norm and Perceived Behavioural control, it is clear that it is not only attitude that influence intentions but subjective norm and perceived behavioural control as well. For it is said that if there are favourable attitude and subjective norm and the perceived behaviour control are high, then there will be a strong individual's intention to perform a behaviour.[114]

Distinction is sometimes made between intentions and willingness to behaviour. It is argued that while intentions are plans that one formulates to achieve a particular behaviour which involves thorough reflection of the consequences, willingness has less forethought. For that matter with intentions, people are willing to accept the consequences than with willingness.[115] This is because the individual spend more time with intentions than willingness. All the basic elements and determinants of TPB are simply structured as shown by figure 3.

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[114]Ajzen, Icek, 1988, pp 132-133
[115] Gibbons, Frederick, et al, 1998, P.321

Figure 3:   Basics of the Theory of Planned Behaviour
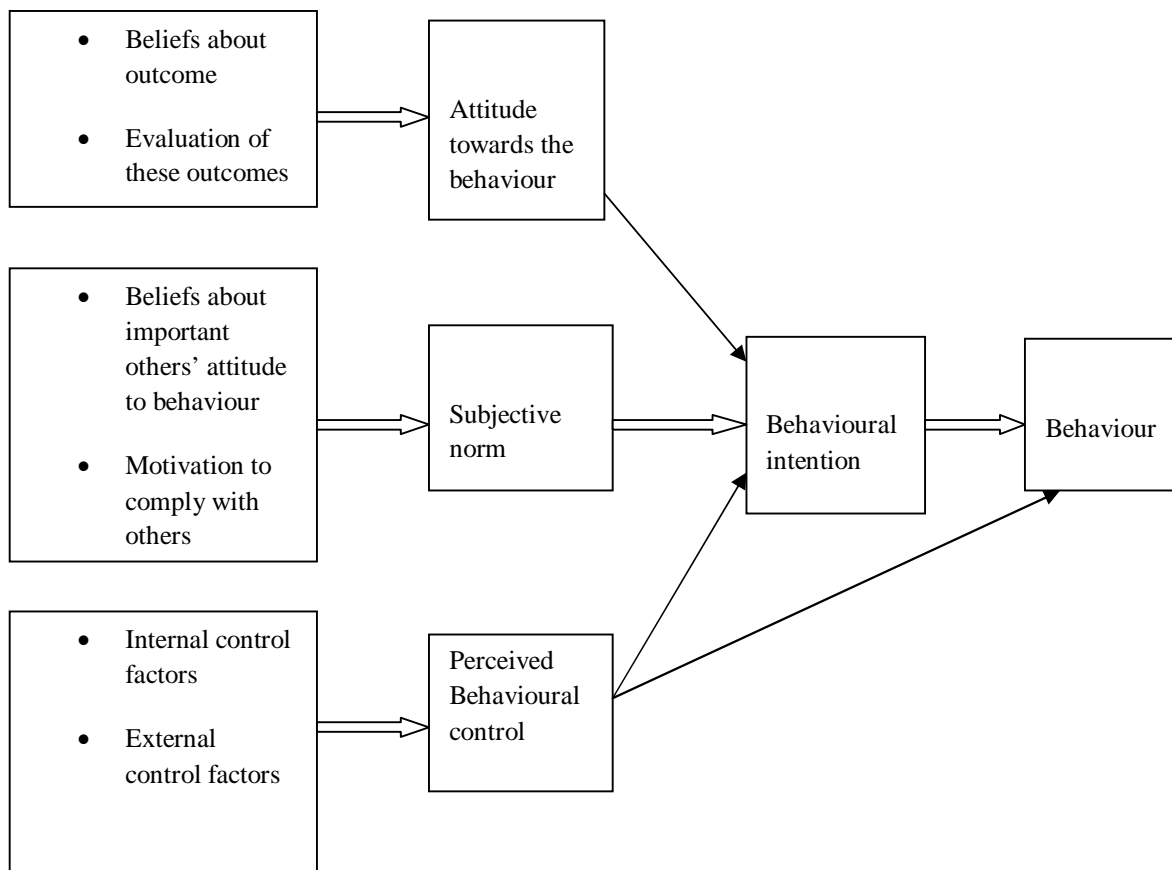
Source: Ogden, Jane, 2007, p. 31

One may realised that detail explanation was not given to behaviour as a component on the structure of TPB. This is because the focus of the study is up to behavioural intentions and not to behaviour.

2.3.   Some researches done based on TPB

Many studies have been done based on TPB from diverse angles with different objectives. It has been used in predicting wide range of behaviours but mostly in health-relevant behaviours and in all these, PTB have been successful in its application in explaining variations in intentions and actions across behaviour. Sometimes, there are significant variations in the findings but they are mostly due to the differences in behaviours in the areas it is applied.[116] These variations will come out clearly in the following studies to be discussed.

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[116] Conner, Mark and Normann, Paul 2007, pp. 176-214

The efficacy or the extent of control of TPB was assessed in a meta-analytic review by Christopher Armitage and Mark Conner in 2001. The aims of the study among others were to measure the extent of control of the theory, to assess the extent to which the theory predict the relation between observed and self reported behaviour, consider the differences in the conceptualization of intentions and evidences for their differences, consider the differentiation between PBC and self-efficacy and to consider the measurement adequacy of subjective norm.[117]The aim of the study were necessary because it had been realised that TPB and other behavioural decision-making models turn to rely on self-reports despite arguments outlining their weaknesses and it is important in this study because it influences the methodology. Also, despite the argument of Icek Adjen[118] that perceived behavioural control and self-efficacy can be used interchangeably, other scholars argue that, they are completely different from one another. Moreover, it has been realised that there are many ways of measuring intentions and they are distinct from self-predictions. Furthermore, many researchers have realised that subjective norms is the least predictor of intentions and behaviour.[119]

The study revealed that TPB is a good theory to predict intentions and behaviour and that the prediction of self-reported behaviour is stronger than the observed behaviour. It also revealed that there are evidences for the distinction between desire, intentions and self prediction. Moreover, there are evidences supporting the distinction between perceived behavioural control and self-efficacy. In addition, subjective norm can be a good predictor of intentions and behaviour if only it is measured with multi-item scales.[120]

Rise, Astrøm and Sutton[121] applied TPB to predict intentions and use of dental floss among adolescents who were at the age of fifteen. This is because dental floss is considered to be strong in reducing a number of dental diseases.[122]It was a third follow-up of a research project which started in 1990 and the empirical data for the study under consideration was collected in 1992. The findings of the study showed that the intentions of the adolescents to use the dental floss are influenced by subjective norm, attitude and perceived behavioural control. However, subjective norm was the strongest

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[117] Armitage, Christopher and Conner, Mark, 2001, p. 475-479.
[118] Ajzen, Icek, 1988
[119] Ibid, p.478
[120] Armitage, Christopher and Conner, Mark, 2001, p. 485
[121] Rise, Jostem; Astrøm, Anne and Sutton, Stephen, 1998
[122] Ibid, p. 223

predictor followed by perceived behavioural control.[123]The findings of this study were contrary to many other studies where attitude was found to be the highest predictor of intentions. Considering them, one can say that subjective norm was the highest predictor because of the influence that the adolescents may have from their parents or guardians since they may still be under parental control at that age.

Chan and Fishbein[124] studied the determinants of college women's intentions to tell their partners to use condoms based on the TPB and an additional variables measuring emotional reactions (based on the theory of interpersonal behaviour developed by Triandis in 1977. The study found that attitude, subjective norm and emotional reaction were significant predictors of the intentions of the college women to tell their partners to use condom with a minimal contribution from perceived behavioural control.[125]Attitude was the highest predictor of the intentions followed by subjective norm. Since emotional reaction was seen to be significant, it was proposed that it should be added in assessing attitude although it may first need further researches. It was concluded that perceived behavioural control was not significant because the goal of using the condom was not under the control of the women but under that of their partners.[126] These findings as well support the argument that specific determinants become significant based on the focus of the study. Although emotional reaction was seen to be significant and recommended that more research should be done into it, it will not emphasised since it is not part of the main determinants of TPB.

Beale and Manstead[127] undertook a study to predict mother's intention to limit frequency of infants' sugar intake by testing the TPB. In carrying out the study, mothers with babies within the ages of five to seven months was selected based on their attendance to baby clinic and they were group into two to form the experimental and control group. The experimental group received a dental health educational programme whiles the control group did not.[128] The analysis of the study show that the intervention made a significant change in attitude of the experimental group than the control group. However, subjective norm and perceived behavioural control had no significant changes. In all there was no significant difference between the intentions of the mothers

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[123]Rise, Jostem; Astrøm, Anne and Sutton, Stephen, 1998, p. 229
[124] Chan, Darius and Fishbein, Martin, 1993
[125] Ibid, pp.1455-1568
[126]Ibid
[127] Beale, and Manstead, 1991
[128] Ibid, pp. 416-428

in both groups.[129]This study brings out the argument that educational programmes have influence on the attitude of people.

Johnston and White studied students' binge-drinking behaviour where binge drinking was defined as the consumption of five or more standard alcoholic beverages in a single session.[130]It was to test the role of group norms under TPB. The study found that attitude, subjective norm and perceived behavioural control significantly and almost equally predicted the intentions of the students towards binge-drinking. This means the students who had positive attitude, perceived more social pressure towards binge-drinking and they also perceived the drinking to be easier to do. An additional variable known to be perceived norms of a behaviourally relevant reference group which was based on the social identity theory (group norms and group identification) also showed a significant relationship with the intentions of the students towards binge drinking. This means that support from friends have much influence of students intending to drink more at a goal.[131] It was mentioned under the discussion of subjective norm that all other distinctions in terms of norms will be classified under subjective norm and so this perceived norm will be added to the subjective norm in the study of Johnston and White to say that there was a strong pressure from important others to comply.

Blanchard et al applied TPB to understand the physical activity behaviour in African American and Caucasian college students in Atlanta, USA.[132]The study resulted that attitude and PBC were significantly associated with intentions but subjective norm was not within both ethnic groups. This actually violated the assumption that the cultural values among the African Americans as in subjective norm may have influence on the intentions of that group. This showed that when it comes to physical activities, subjective norm has no influence. What matters are the interest and the perceived easiness and difficulty to perform the activity.[133]

The study of Fekadu and Kraft[134] on the role of social norm and group identification on expanding the TPB to predict the intentions of women to use contraceptive in Ethiopia; found that subjective norm was the outstanding determinant. All the same, attitude and

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[129] Beale, and Manstead, 1991, pp. 416-428
[130] Johnston, Kim and White, Katherine, 2003, p. 67
[131] Ibid, pp.71-72
[132] Blanchard, Chris et al, 2008, p. 342
[133] Ibid, p. 342, p. 345
[134] Fekadu, Zelalem and Kraft, Pal, 2002

perceived behavioural control were also significant but not as subjective norm.[135]This was contrary to many studies where subjective norm was not the highest predictor and even sometimes not significant. All the same, it was similar to the findings of Rise, Astrøm and Sutton. This outcome can be associated with the focus of the study where the location of the study has more respect for cultural values.

From the analyses of these studies, it comes out that none of the determinants of TPB is insignificant. However, some conditions should be in place in terms of target group, enough data collection period and other appropriate methodology to make them significant, for TPB is a complete theory of behaviour in that any other influences on behaviour impact by influencing the components of TPB.[136]

2.4.   Criticisms against TPB

Despite the many applications of TPB, it has as well been criticised to be weak in many ways. When it comes to perceived behavioural control, it is criticised to be limited to perception of control and not actual control issues.[137] That is it gives more importance to internal factors than external factors. This issue was raised during the discussion of perceived behavioural control where it was mentioned that perceived control alone is not enough to aid one to engage in a behaviour.

Another problem of TPB is that when it comes to subjective norm, there is no consideration of the individual's behaviour history and the broader social pressures.[138]TPB mentions only significant people but says nothing about the broader social pressure. Nothing is said about political issues or international factors which influences the individual.

It has been argued that the distinction between attitude and subjective norm are arbitrary because the behavioural belief which is a determinant of attitude and normative belief which is a determinant of subjective norm can be stated equally. An example is given like 'as a farmer, my customers want me to use ecosan fertilizer in farming' which is a normative belief can be stated the other way round like 'using ecosan fertilizer in farming will make my customers happy' to be behavioural belief which in actual sense,

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[135] Fekadu, Zelalem and Kraft, Pal, 2002, pp. 38-40
[136] Conner, Mark and Normann, Paul 2007, pp. 176-214.
[137] Ibid, pp. 182-183
[138]Ibid

mean the same thing. This normally results in the statistical problem of multicollinearity.[139] Multicollinearity is a problem normally realised in multivariate regression where one of the independent variables is perfectly or partially correlated with one or more other independent variables which make it impossible to derive unique estimates when it is the perfect collinearity type; or result in other consequences on the significance test for the regression co-efficient when it is a partial one.[140]

In further criticisms, it has also been asked about how the addition of only one variable (perceived behavioural control) to the TRA can make TPB a complete model as many other variables like habit, perceived moral obligation and self-scrutiny may predict intentions and behaviour with evidence.[141]Moreover, the name of the theory which involves the concept 'planning' is not visible because the theory does not show the process people go through to formulate and act on their plans.[142]

The measure of attitude which rate behaviour on evaluative dimensions like good-bad, easy-hard, has also been criticised. This is because this evaluation of the behaviour and feelings about the behaviour are assumed to be the same in TPB. However, this is not always the case. Someone may evaluate the consequences of a behaviour and find it to be positive but may not have the feelings to engage in the behaviour. An example is given that an obese person may evaluate aerobic exercises to know that it will help in reducing weight but the individual feeling shy of the body may not engage in it at all.[143]

Despite these criticisms raised against the TPB, it will be applied for the theoretical framework of the paper because it predicts the behaviour of the individual from the societal perspective where subjective norm and perceived behavioural control are considered apart from the individual's attitude. Moreover, it is one of the widely used theories in diverse health-related behaviours as indicated earlier. It is also straight forward considering its structure. With this theory, one will be able to detect if factors like attitude which relies on evaluation of outcomes, social norms and perceived behavioural control forms the behavioural intentions of the farmers towards ecosan. As

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[139] Eagly, Alice and Chaiken, Shelly, 1993, p. 171
[140] Berry, William and Feldman Stanley, 1985, pp.37-40
[141] Ibid, 189
[142] Ibid, p. 189
[143] Allen, Felicity, 1998, p.61

behaviour is determined by behavioural intentions and perceived behaviour control, one can then move on to predict their behaviour towards ecosan in future studies.

2.5. Creating a heuristic model to explain behavioural intentions

With ideas from the literature reviews on ecosan and TPB, the following hypothesis and extended hypotheses are derived:

Attitude, subjective norms and perceived behavioural control determine the behavioural intentions of farmers to use ecosan fertilizer in agriculture

The extended hypotheses are:

> i. The more positive attitude the farmers may have the more they will intend to use ecosan fertilizer in agriculture
>
> ii. The more positive subjective norm may exist for the farmers the more they will intend to use ecosan fertilizer in agriculture.
>
> iii. The higher the perceived behavioural control of the farmers the more they will intend to use ecosan fertilizer in agriculture.

The hypothesis is presented in figure 4.

Figure 4: graphical representation of the hypothesis

Independent variables   Dependent variable
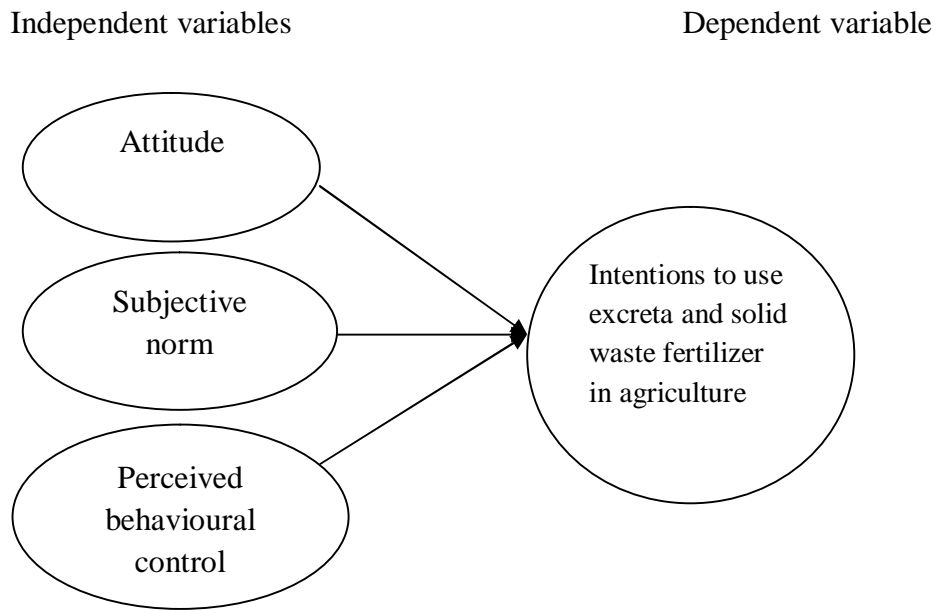
Source: Author's own

It is important to note that this paper only focuses on the independent variables; attitude, subjective norm and perceived behavioural control and the dependent variable behavioural intentions to use excreta and solid waste fertilizer. This is because farmers who are aware of ecosan but have not started using it are the target group of the study.

Having identified the hypotheses of the paper, the next chapter describes the case study with emphasis on the study area and the preparation of the ecosan fertilizer, with an overview of chemical fertilizer. The chapter for methodology follows after that.

3.   The Case Study

3.1.   The study area

Map 1: Map showing the research area

Source: Adamtey, Noah, 2010

Buobai co-composting of faecal sludge and solid waste project is considered as the case study of this research. This project was chosen because its implementation has increased awareness of excreta based fertilizer among farmers in that region which is necessary for this research. Buobai is a community which is situated 15 km away from the centre of Kumasi.[144] Kumasi is the capital of the Ashanti Region in Ghana where the people are predominately Akans (81.8%).[145] Considering the prevalence of preventable diseases in this region in relation to other part of Ghana, malaria tops the list (44%) and diarrhoea is the third (4.3%).[146]

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[144] Olofunke, Cofie and Kone, Doulaye, 2008, pp. 1-2.
[145] Ghana Statistical Service, 2008, p. 8.
[146] Ghana Statistical Service, 2005, p.2.

It is estimated that on daily basis, 500m^3 of faecal sludge and 860 tonnes of solid wastes are generated in Kumasi.[147] Research shows that in Kumasi, organic wastes are the highest form of household wastes generated which calls for appropriate means of disposal.[148] If these wastes are not well treated, they end up polluting a river in the city called *Wewe* River and other water bodies.[149] Landfill is seen as one option to manage these wastes but there are many questions about it which still remains unanswered. This could be about whether the liquid, gas and other emissions from it are not causing problems to the society and for that matter how long should the landfill be monitored? Which other land areas should be earmarked for future landfills when onea area is full?[150]

Urban and peri-urban agriculture is very important in Kumasi because it contributes to food security and increase the income of the urban poor. It is estimated that 70 ha of land are under urban farming for tubers, cereals and vegetables whiles in the peri-urban areas it is 12,000 ha.[151] However, research show that urban and peri-urban agricultural soil lack organic matter and nutrients which means there is a need for nourishment.[152] The Buobai co-compost project is a pilot research action to link sanitation and agriculture. It was started in 2002 by a joint cooperation of the International Water Management Institute (IWMI), Department of Water and Sanitation in Developing Countries (SANDEC) of the Swiss Federal Institute for Aquatic Science and Technology (EAWAG), Kwame Nkrumah University of Science and Technology (KNUST) and Waste Management Department of Kumasi Metropolitan Assembly.[153] Considering the explanation given to the types of ecosan projects, it is the type which upgrades peri-urban and urban sanitation systems for agriculture and involve the assistance of inter-governmental organisation and the local government. This is because of the difficulty of the individual households to switch facilities immediately. The components of sanitation used in this project are excreta (faecal sludge) and solid bio-

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[147] Olofunke, Cofie and Kone, Doulaye, 2008, p. 1.

[148] Ketibuah, et al, p. 4

[149] Vodounhessi, Anselme and Von Muench, Elisabeth, 2006, p. 6.

[150] Diaz, Luis, 2006, pp. 1325-1326

[151] Olofunke, Cofie and Kone, Doulaye, 2008, p. 1

[152] Vodounhessi, Anselme and Von Muench, Elisabeth, 2006, p. 2

[153] Olofunke, Cofie and Kone, Doulaye, 2008, pp. 1-2.

wastes.[154] These two 'raw materials' are then processed into soil conditioners and fertilizers. A detail of how the fertilizer is prepared is explained in section 3.2.

3.2.   The preparation of the ecosan fertilizer

One of the recommended ways in managing wastes is through composting.[155] Quoting from Gomez, "Composting is a microbial reaction of mineralisation and partial humification of organic substances which, under optimum conditions, take place within a month."[156] It mostly required that the composting process should be aerobic so that the organic materials can be mineralised and humified. When Aerobic co-composting process is used no odour is produced and the high temperature is effective in reducing the pathogens of the wastes.[157] There are some conditions that should be met in waste disposal industries to make compost suitable. These are; there should be a brief process with low energy consumption, the end product should be of standard for agriculture purposes as well as having satisfactory fertilizer value and the end product and the plant used in production should be hygienic.[158] There are two main ways of making composting which can either be open system or closed system where they all have their own advantage and disadvantages and the compost can be made from wastes from food, tree barks, saw dust, sewage sludge, household wastes and others. The quality of the compost depends on the mixture of the wastes used.[159]

Considering the preparation of the ecosan fertilizer which at one point in this section may be called co-compost (because it comprises of two raw materials) and at another time called *comblizers* (based on the addition of other component), the two set of wastes needed are firstly gathered. The municipal solid wastes from the households, markets and other public places are brought to the project site from the metropolis, they are sorted out into different fractions like stones, plastics, nylons, papers, metals, textiles, wood, and organic solid wastes. The organic wastes are then separated for use. The human excreta are got from the septic tanks and the public toilet sludge from the pit latrines. These set of wastes are used because they complement each other.[160] The faecal sludge is relatively high in nitrogen and moisture whiles the solid waste is high in

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[154] Olofunke, Cofie and Kone, Doulaye, 2008, pp. 1-2.
[155] Dijkema, Reuter and Verhoef, 2000, p. 635
[156] Gomez, 1998, p. 310
[157] Rabbani, et al 1983: p.10.
[158] Ibid
[159] Gomez, 1998, pp. 311-.313
[160] Olofunke, Cofie and Kone, Doulaye, 2008, pp. 1-2

organic carbon and has good bulking quality.[161] The nutrients needed in the soil to ensure growth are divided into three groups. They are macro or primary nutrients which comprises of nitrogen (N), phosphorus (P) and potassium (K). The major or the secondary nutrients consist of calcium (ca), magnesium (mg) and sulphur (S). The micro or tertiary nutrients include chlorine (Cl), iron (Fe), manganese (Mn), boron (B), zinc (Zn) and copper (Cu).[162] For the sake of necessity, the primary nutrients will be elaborated in terms of their volumes in the faecal sludge and municipal organic waste. Before composting, the organic municipal solid wastes' per-capita nutrients is estimated to be 0.55 - 1.1kilograms (kg) of N content, 0.2-0.4kg of P content, 0.55kg of K and 16-22kg of carbon.[163] Table 1 below shows the primary nutritional values of the municipal solid wastes.

Table 1:   The nutritional component of municipal solid wastes before composting

Nutrient	Contribution in kg/capita per year
Nitrogen (N)	0.55 - 1.1
Phosphorus (P)	0.2 - 0.4
Potassium (K)	0.55

Source: IMWI&SANDEC, 2002, p.4

The excreta before composting contain high amount of N, P, K and carbon both in urine and faeces and they are sometimes higher than that of the municipal solid wastes. This is because the nutrient levels of solid wastes do change based on the types of wastes used.[164] This shows that these wastes in real sense are resources. See table 2 for the primary nutritional values of excreta before composting.

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[161] IWMI & SANDEC, 2003, p.17
[162] Yara fertilizer industry handbook, 2009, p.2
[163] IWMI&SANDEC, 2002, pp.3-4
[164] Ibid

Table 2:   The nutritional values of excreta before composting

nutrient	Nutrient in kg/capita year		
	Urine (500 l/year)	Faeces (50 l/year)	Total
Nitrogen (N)	4.0	0.5	4.5
Phosphorus (P)	0.4	0.2	0.6
Potassium (K)	0.9	0.3	1.2

Source: IMWI&SANDEC, 2002, p.3

During the preparation, the two forms of wastes are mixed up at a ratio of 2:1 and dewatered on a drying bed.[165]Considering the explanation given about the different ways of making compost, one can say that the open system approach to composting is use in this case. The dewatered faecal sludge are then mixed up with the organic solid wastes at the ratio of 2:1 and then composted and monitored for three months through aerobic composting processes. This type of fertilizer produced is called co-compost. The co-compost is then sieved and maintained at 10% moisture content. [166] Figure 5 shows the stages in making the co-compost.

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[165] Adamtey, Noah et al, 2009, p. 2430
[166] Ibid

Figure 5:   Stages in the production of the ecosan fertilizer

Source: Adamtey, Noah, 2010

According to researches done, the co-compost after the process maintains a high level of K and P but low in N. The N is lost especially during the drying of the faecal sludge which contains ammonium component of nitrogen.[167] This means farmers will need a large quantity of the co-compost for a small piece of land. This therefore calls for the enhancement of the N content if the interest of the farmers is to be considered. This is because the separate application of co-compost and inorganic N was assumed to be risky and labour intensive for the farmers. The appropriate way to top up N level (with inorganic N) should be at the production level. To do that, either ammonium sulphate or urea is mixed with the co-compost for both the organic and the inorganic elements to contribute 50% to the N content of the fertilizer. The new fertilizer which comes out

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[167] Adamtey, Noah et al 2008

after the enhancement of the N is named *comlizer* (excreta based compost-fertilizer mixture).[168] When the fertilizers are produced, they are supplied to the farmers in the peri-urban and in the urban area for farming. Some crops produced with the fertilizer are tomatoes, sweet pepper, lettuce, cabbage, spring onion and carrot.[169] The application of compost which is an organic fertilizer has been argued to have more potentials of increasing plant yield as compared to inorganic fertilizers because of its "organic matter" effect which makes it similar to the soil.[170]It is noted to suppress the development of nematode which eat the roots of plants and prevent diseases which makes it unnecessary to use pesticides in farming. It as well helps improve the quality of clayey and sandy soil. Table3 shows the impact of compost on these types of soil.

Table 3:   Impact of composting on sandy and clayey soil

Impact on sandy soil	Impact on clayey soil
Water content is increased	Aeration if soil is increased
Water retention is increased	Soil is permanently increased
Aggregation of soil particles is enhanced	Potential crushing of soil surface is reduced
Erosion is reduced	Compaction is reduced

 Source: Strauss, Martin et al, 2003, p. 22

To attain these benefits, it is better if wastes from all sources before their application to farms pass through composting processes so as to minimise their negative effects on the soil, reduce plant and animal pathogens and to increase their soil fertility functions. The raw application of organic waste without composting may have some negative effect because of initial variations that may exist between the organic wastes and the soil. The study of Hernández supports this argument as it came to the conclusion that because of the humified nature of compost, it helps the soil than direct application of sludge.[171] Nkansa-Boadu realised in his study that some farmers in the Manya Krobo district of

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[168] Adamtey, Noah, et al 2009, pp.17 and 2430
[169] Olofunke, Cofie and Kone, Doulaye, 2008, pp. 1-2
[170] Senesi, 1989, p.523-526
[171] Hernández, et al 2006, p. 1376

Ghana apply the faecal sludge direct in their farms without composting.[172] Considering the arguments about composting, one can say that this practice of direct application is not the best as it has consequences on the soil and on the quality of crops produced.

Apart from the raw application of waste, even the application of immature compost also has its own consequences. It can biologically block the soil-available nitrogen; increase carbon substances in the soil and in the plant and it can create toxic compounds like toxic acids in the soil. It is therefore recommended that the compost should be tested of their maturity before their application. Some of the criteria to test the maturity of the compost are the physical characteristics like temperature, colour, odour and other biological and chemical studies like microbial activity, humic fraction of the compost and toxic test.[173]Moreover, it is important to note that for the compost to be more effective, the soil composition and properties, crop requirement and geo-climatic conditions should as well be taken into consideration.[174]Since peri-urban and urban areas of Kumasi are noted to lack top soil nutrients, composting can be of help. As inorganic/chemical fertilizer was mentioned as an additive to enhance the co-compost, it is important to have a general view of what it entails.

3.3. Chemical fertilizer

The challenge of providing food for the billions of people suffering from chronic hunger due to extreme poverty, the global demand for fertiliser has kept on increasing since the topsoil fertility is also decreasing.[175] Chemical fertiliser which is mostly seen to be easily available to farmers in the market has been experiencing higher prices on the world market. One cause to this high price of fertiliser is associated with increase in prices of grains like maize as they are used to produce bio fuels especially in the industrialised countries. Increments in the production of grains increase the demand for chemical fertilizer. Transport costs in terms of importation in addition end up making the prices extremely higher. Another problem influencing the price is the scarcity of the basic materials or nutrients needed to produce this chemical fertilizer. The global P reserve is being depleted entirely. P is needed to assist the root development of the plant and its ability to resist drought. Also, it ensures the development of seed and ripening of

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[172] Nkansa-Boadu, Frank, 2006, p. 55
[173] Jiménez, Emeterio, Iglesias and Garcia, Victor, Perez, 1989, pp.118-120
[174] Senesi, 1989, p.525
[175] Arno, Rosemarin, et al, 2008, p.13

the fruit of the plants. The same problem of depletion affects the supply of potassium because only few countries have enough potash rocks. K is responsible for high yield in plants as it is central to photosynthesis processes and it helps the plant to fight diseases. Although there is significant availability of N because it is derived from natural gas, all the three components should be available to produce the NPK fertiliser; unless they are going to be used separately. N constitutes the protein part of the plant and it helps the plants to get its colour, growth and yield.[176] These problems of higher prices and scarcity of materials make the chemical fertiliser become expensive for the poor countries to afford. When ecosan is promoted on a larger scale, then the high prices can be minimised and sustainability be assured. What actually differentiate the chemical fertiliser from the ecosan fertiliser are the numerous chemical processes that the chemical fertiliser passes through.

To produce the NPK fertiliser for example, N should be processed out of ammonia. Ammonia is produced through chemical processes at the industrial level by combining N in the air with hydrogen in natural gas at high temperature and pressure. This is done with the addition of catalyst. This process of producing ammonia is called Haber-Bosch process due to the higher temperature and pressure used. In producing P, phosphate rocks are digested with strong acid. It is then combined with ammonia to produce Di-ammonium phosphate of Mono-ammonium phosphate through a process called ammonization. To get K, it should be mined from salt deposit and countries noted to have larger deposits of potash are Canada and Russia. When these nutrients are available, then can they be combined to produce the NPK chemical fertiliser.[177]With the understanding of the how the research area is and how the different types of fertilizers are prepared, the next chapter focus on the methods and tools used in the data collection and processing in this study.

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[176] Arno, Rosemarin, et al, 2008, pp.13-18

[177] Yara fertilizer industry handbook, 2009, p.11

4. Methodology

4.1. Information source

Both primary and secondary data was used in this paper. For the primary data, quantitative methods were employed in gathering the data. The quantitative approach which is based on the questionnaire helped to establish the correlation between the independent and dependent variables. With the quantitative method, defined variables which are linked to frame the hypothesis are tested through data collection and analysis. Moreover, the instrument used in data collection is pre-determined and fined-tuned as in a questionnaire. This is not the case with qualitative method which begins by defining general concepts and the variables form part of the outcome of the research.[178]Details of how the quantitative methods were employed are given in the following sub-sections.

4.1.1. Questionnaire survey

The main part of the data collection was the administering of questionnaires. In all hundred and fifty (150) questionnaires were administered. The respondents were drawn from four communities. That is around the project area and other three peri-urban areas of Kumasi where the people engage in farming activities. These communities are Buobai, Kwaso, Jachie and Feyiase. Two research assistants were employed to help in administering the questionnaires due to the large quantity. After meeting the research assistants to explain the concept to them and going on the field together for a day, then the group was divided into the different communities. In the communities, assistance of a guide was employed to help identify the farmers. Before then, the questionnaire was pre-tested to check if it was applicable. With that pre-test, relevant changes were made before starting with the main administering of the questionnaire. The questionnaire contained both closed and open ended questions. It took approximately, 20-30 minutes to administer one questionnaire.

Accidental sampling was used to select the cases in the target population. This is a non-probability sampling method which is also called haphazard or convenient sampling.[179] This is a kind of sampling where the respondents are selected accidentally; that is anyone who fit into the target group is interviewed.[180]This kind of sampling can be

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[178] Brannen, Julia, 1992, pp.4- 5.
[179] Kalton, Graham, 1983, p. 90
[180] IPDET, 2007, p. 452.

biased and therefore generalization on the entire population cannot be made.[181] However, since there is no known sampling frame of the target population which is very crucial for random sampling, this method was appropriate for this study.

4.1.2. Indicators

"The development of adequate empirical indicators thus provides a crucial link in the social research process."[182] This helps to ground abstract concepts empirically. "In order to empirically test a hypothesis employing abstract concepts, one must specify observable and measurable characteristics of the units or cases under study"[183] and to ascertain these measurable characteristics called indicators for a particular concept, a series of questions needs to be asked and summed up to produce the desired indicator.

Following the explanations given above for indicators in this paper, measurable indicators were defined and appropriate questions were asked for all the independent and dependent variables (attitude, subjective norm, perceived behaviour control, behavioural intentions) of the hypotheses which formed the questionnaire. Other demographic variables like sex, marital status, family size, educational level, religious affiliations were also included.

The questions for attitude and behavioural intentions had the scale scores between 1 and 4, where 1 means extremely positive and 4 means extremely negative or with similar wording. The questions for subjective norm and perceived behavioural control were mixed up. There were some indicators which followed the same pattern of attitude and behavioural intentions whilst others had opposite arrangement. In that opposite situation, 1 means none, and 4 means all. All the same, during the analysis, these indicators were re-coded to follow the same pattern where necessary to enable correct outcomes. Table 4 shows the indicators and scales used for the dependent and the independent variables. Details on how these indicators were framed into questions can be found in the annex I of the paper.

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[181] Kalton, Graham, 1983, p. 91
[182] Sullivan, John, Lawrence and Feldman, Stanley, 1979, p. 10.
[183] Ibid, p. 9

Table 4:   Indicators and scales used for the dependent and the independent variables

Variables	Indicators	scale
Attitude	1. Health implications in using ecosan fertilizer	no danger at 1- 4 high danger
	2. Ecosan fertilizer approach as good or bad way to reduce wastes in the society	very good 1- 4 very bad
	3. Pleasant to use the fertilizer	very pleasant 1- 4 very unpleasant
	4. Joy in using the fertilizer	very enjoyable 1- 4 very unenjoyable
	5. Wise to use the fertilizer	very wise 1- 4 very unwise
	6. Necessary to use the fertilizer	very necessary 1 - 4 very unnecessary
	7. Expectations as whether ecosan fertilizer will increase yield of agriculture	very much 1- 4 not at all
	8. Thought about customers expectations	strongly approve 1- 4 strongly disapprove
	9. Expression of overall attitude	extremely positive 1- 4 extremely negative
Perceived behavioural control	1. Ability to transfer fertilizer to the farm	very easy 1- 4 very difficult
	2. Confidence in applying the ecosan fertilizer in the farm	strongly agree 1- 4 strongly disagree

Subjective norm	1. Opinion as to whether other farmers will intend to use the ecosan fertilizer or not	very likely 1- 4 very unlikely
	2. Opinion about support from community members	none 1- 4 all
	3. Opinion about support from family and close friends	none 1- 4 all
	4. Opinion about existing religious and traditional disapproval or approval	strongly approve 1- 4 strongly disapprove
Behavioural intentions	1. Statement about the overall intentions	definitely will 1- 4 definitely will not

Source: Adapted from Conner Mark and Norman Paul, 2007, pp. 197-199

4.2. Data analysis

SPSS was used in the analysis of the data collected. The questions of the independent and the dependent variables were mainly Likert (ordinal) scaled. Moreover almost all of the variables had many questions which means those similar questions needed to be computed together to represent the variables they represent. To achieve that, reliability analysis of those questions were measured to see if they can really be added to form one variable. The Reliability analysis justify if a scale consistently reflect the construct it is measuring.[184] When the questions are added, a continuous scale similar to a metric scale becomes the new output. Cronbach's alpha was used in the reliability analysis since it is meaningful for Likert scales where the items are regarded as equally representing the target variables.[185] A Cronbach's α value of 0.7 and above are acceptable which shows reliability among the questions.[186] Considering the nature of the hypothesis of the research, where three independent variables are all influencing the same dependent variable, multiple regression was seen as a better option in analysing since multiple regression is a powerful tool to assess the impact of many independent variables on one

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[184] Field, Andy, 2005, p. 666.
[185] Bohner, Gerd and Waenke, Michaela, 2002, p.32
[186] Field, Andy, 2005, p. 668 and 674

dependent variable.[187]   Kerlinger and Pedhazur put it that, "multiple regression is a method of analysing the collective and separate contributions of two or more independent variables, Xi, to the variation of a dependent variable, Y."[188]Although it is assumed that multiple regression is possible in interval/ratio scales, it is also possible in Likert scale as well.[189]

In critical terms, Likert scale has one main disadvantage of not having exact level of measurement of the resulting scale scores. That is it has no internal checks for its representative measurement properties so it is difficult to say it has interval or ordinal measurement.[190]All the same, recent researchers have developed the basis to assign interval or metric properties to it because it is based on psychometric traditions.[191] Before that, it had been argued by Roskam that there are some features of metric data which are similar to ordinal data (the linear model for ordinal data is closely similar to the model of factor analysis for metric data) and for that matter, metric analysis of ordinal data is indeed a basic measurement tool.[192]Some even argue that ordinal variables can be added to the multiple regression directly without dummy coding. This is because the outcomes are mostly equivalent to ordinal-level statistics and moreover, multiple regression analysis is powerful that the risk of error is acceptable.[193]

Apart from that, Spearman's *Rho* was also used in analysing the correlation between the individual independent variables and the dependent variable as in the extended hypotheses since it is an appropriate measure of correlation between ordinal variables with large scales or scores.[194]The application of these tools and their outcomes can be found under the Empirical findings of this paper.

4.3.   Limitations and challenges

Considering the indicators for the variables, it would have been the best to have multiple- items or questions measure for all so that they can assume a complete continuous scale after they have been computed together. This was not the case for behavioural intentions. This shortfall was due to limited knowledge base on the part of

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[187] Argyrous, George, 2008, p. 198
[188] Kerlinger, Fred and Pedhazur, Elazar, 1973, p. 3
[189] Ibid
[190] Eagly, Alice and Chaiken, Shelly, 1993, p. 55
[191] Ibid, p.57
[192] Roskam, Edward, Elias, 1968, pp. 155-156
[193] Lewis-Beck, Michael, 1980, p. 70
[194] Argyrous, George, 2008, p. 179

the author when the questionnaire was being developed. This makes the application of multiple regression in predicting the variation of behavioural intentions from the three independent variables not fully correct. However, since the authors only want to have a view of this variation, it is applied.

Notwithstanding, it was realised during the data analysis that the responses were to the extremes with some scores on the scale with few ticks. This problem can be associated with the accidental non random sampling used and the fact that the respondents may have had some expectations thinking that if they are extremely negative or positive may have some benefit or cost.

Moreover, considering the theoretical background of the paper, it would have been better to observe the behaviour of the farmers in using the fertilizer but in this paper, the focus was only placed on the behavioural intentions. This is because it will require extra time to collect data for behaviour as it was realised during the discussion of studies on TPB. This is not possible in this study because of limited time.

Last but not the least; it would have been better if more stakeholders have been included in this survey to have diverse intentions towards ecological sanitation. For example, consumers' views, market women's view and institutional arrangements would have added more insight into perceptions towards the project but tine did not permit that.

One issue which was very important for consideration during the data collection on wastes including faecal sludge was the choice of words. In the traditions of Ghana and especially with the *Akan* traditions, it is not appropriate to mention some words when talking to people without first pleading with them and then expressing the word idiomatically. Since this was already known to the researcher, in administering of the questionnaire, appropriate words in the local language were used.

All the same, these limitations and challenge do not prevent one to analyse the data collected and conclude on them. The next chapter focus on the empirical findings of the study.

5.   Empirical Findings

5.1.   Social demographic and other basic characteristics of the sample

The questionnaire of the survey had five main parts representing the dependent, independent, demographic variables and an introductory part which focused on some basic information about the respondents. This section of the paper gives the overview of the findings for the demographic variables and some items in the introductory part considered to be influential.

Out of the 150 respondents, 69 (46%) were females and 81(54%) were males which means the percentage of men interviewed was higher but both sexes were represented in the survey. The bar chart below shows the distribution of the percentage for the gender of the respondents.

Figure 6:   Gender of the respondents
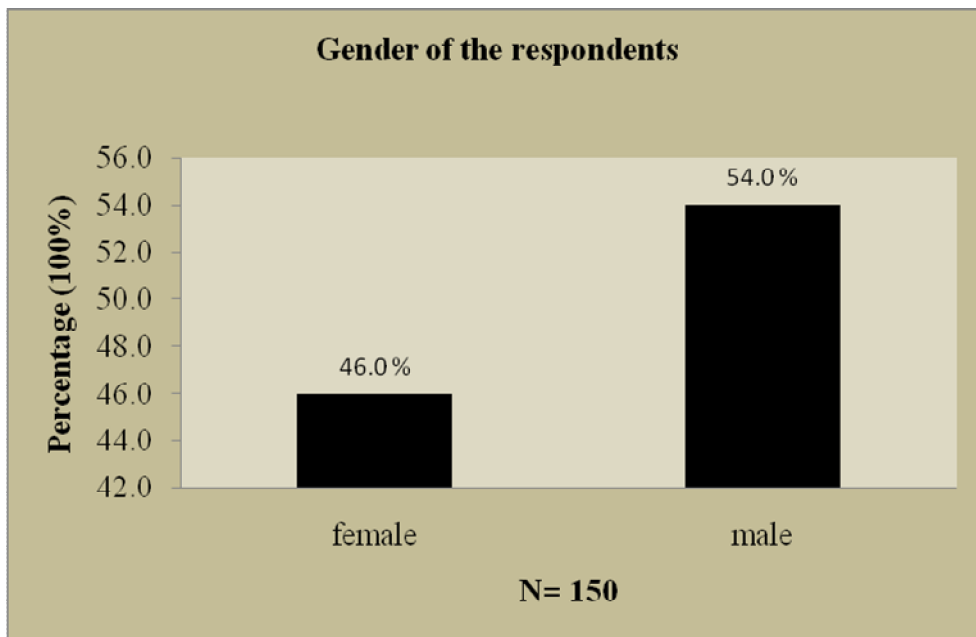
Source: Author's own data

As the ages of the respondent were categorised before the survey, it limit the types of central tendencies that can be analysed. Although it is difficult to measure exactly the mean age because the analysis gave a mean value of 2.99 means the mean value falls within the age groups of 26-35 and 36-45. The median value of 3.00 depict that the central age falls within 36-45. The mode age (ages with highest frequency) of the

respondents fall within 36-45 years, representing 44(29.3%) of the sample. 30(20%) were within 46-55 years, 29 (19.3%) were within 26-35 years, 26 (17, 3%)were up to 25 years, 13 (8.7%) were within 56-65 and 8 (5.3%) were 66 and above. 124 (82.7%) are above 25 years which means the majority of them are matured enough to make an intention not disputing the fact that those up to 25 years can as well make intentions. Figure 7 displays this analysis.

Figure 7:   The age groups of the respondents
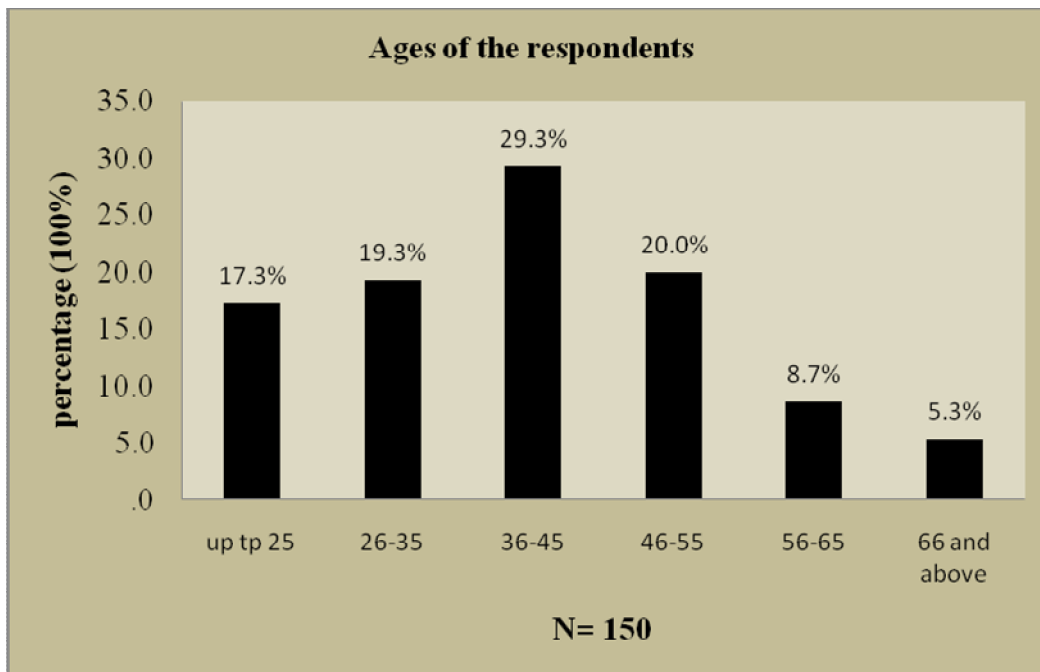
Source: Author's own data

In terms of levels of education, 69 (46%) representing elementary school was the mode of the level of education. 41 (27.3%) had no education, 30 (20%) have had secondary education, 6 (4%) have had informal education, and 4 (2.7%) have had tertiary education. This shows that 109 (72.7%) have had some form of education and can be considered to be exposed. Figure 8 shows the educational level of the respondents.

Figure 8:   Levels of educational of the respondents

levels of education of respondents

N= 150
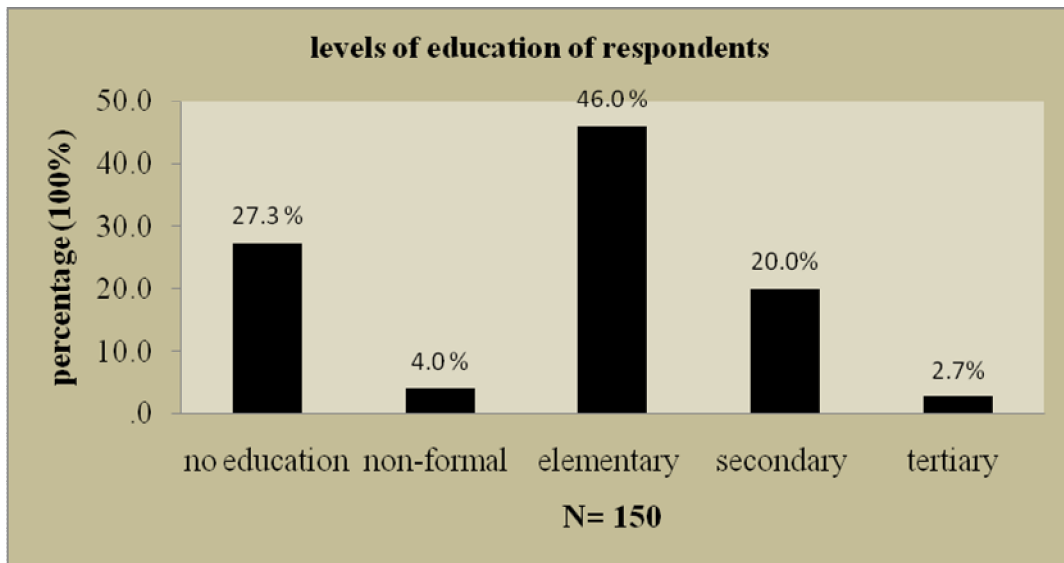
Source: Author's own data

Considering the marital status, the majority of them were married with 99 (66%) of them having that status. 29 (19.3%) were single, 16 (10.7%) were divorced and 6 (4%) widows.   In terms of religious affiliations, 102 (68%) were Christians, 20 (13.3%) were Muslims, 11 (7.3%) practiced African traditional religion, 15 (10%) had no religion and 2 (1.4%) had other religions. This means the majority 135 (90%) of the respondents were religious. Taking the major ethnic groups into consideration, the Akans more who constituted 107 (71.3%) of the sample. Ewes and Gas were 7 (4.7%) each. Hausas were 13 (8.7%), Guans were 2 (1.3%) and 14 (9.3%) were of other ethnic groups. This is understandable because the study area is predominantly Ashantis and they are Akans.

Considering some introductory questions and looking at awareness first, it was realised that 122 (81.3%) of the farmers interviewed are aware of the ecosan project or have heard of the practice of using human and solid wastes as fertilizer in farming. Only 28 (18.7%) have not heard of it. Figure 9 below depict these values.

Figure 9:   Awareness of ecosan
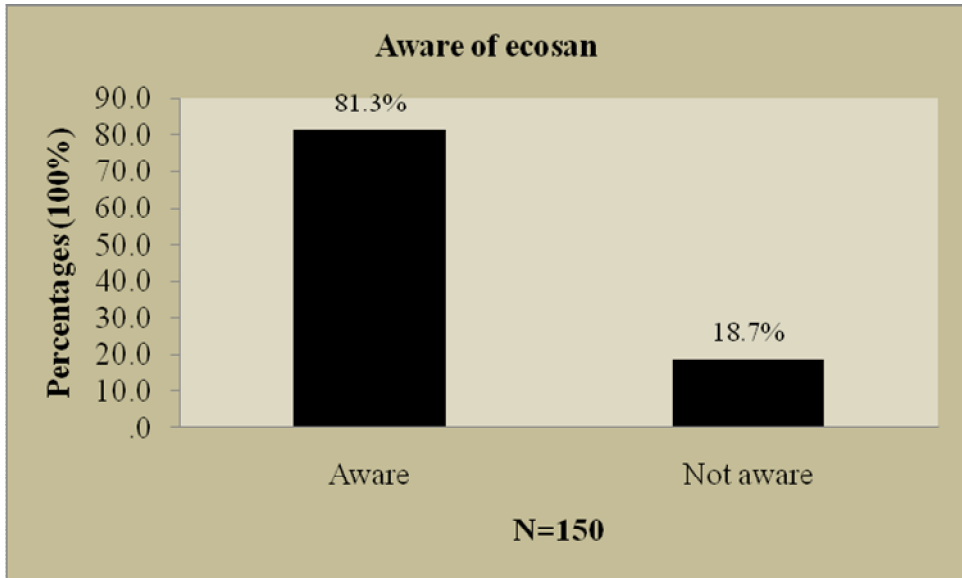
Source: Author's own data

When those who were aware were asked about the means by which they got to know about the concept, 70 (46.7%) representing the majority said they got to know about it from friends and relatives. This means people do discuss about reuse of wastes. 24 (16%) got to know of it through the media, 19 (12.7%) from seminars, 14 (9.3%) said it was through the implementation of the project and 23 (15.3%) said it was through other means. In terms of duration, 111 (74%) of them said they have been aware of it for a year and above. Only 39 (26%) have been aware of it less than a year. This shows that re-use of wastes including human excreta is not strange to the respondents at all. 120 (80%) of the respondents were into the production of food crops such as vegetables, cereals, tubers and plantain. 21 (14%) produce cash crop like cocoa, cashew and coffee and 9 (6%) are into the production of both cash crops and the food crops. 111 (74%) have their farms at the peri-urban areas whiles 39 (26%) have their farms in far villages. The figure below shows the different crops produce by the respondents.

Figure 10:   Crops produced by the respondents
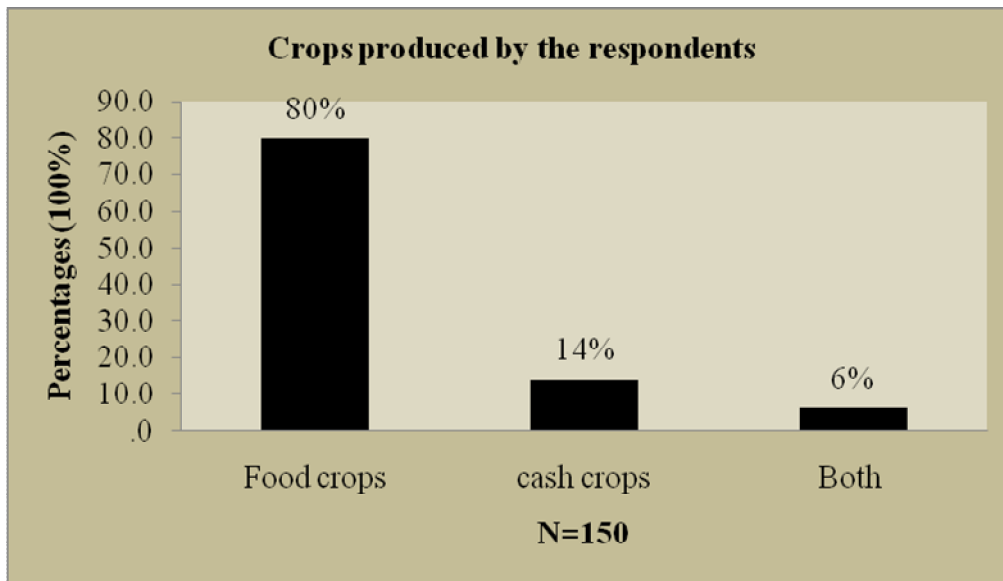
Source: Authors own data

In the next sections of this chapter, the findings and the interpretation of each of the main variables will be shown as well as the relationship between the three independent variables and the dependent variable and other demographic variables. The general discussion of these findings will then be given.

5.2.   Analyses and interpretation of main variables

5.2.1. Behavioural Intentions

Since all independent variables will be analysed in relation to the dependent variable, it is important to have a description of the dependent variable first. As the farmers were asked about their overall intentions to use the ecosan fertilizer in a ranked order of 1 to 4 where 1 means definitely will and 4 means definitely will not, 69 (46%) of them said they will definitely will, 64 (42.7%) said they will, 5 (3.3%) said they will not and 12 (8%) said they definitely will not use the ecosan fertilizer. The central tendency measurement gave a mode value of 1, median value of 2.00 and a mean value of 1.73. The standard deviation value of 0.864 showed that the dispersion of responses from the mean value was very small. These analyses show that there are positive intentions towards the use of the ecosan fertilizer. The Figure and table below show these analyses.

Figure 11:   Behavioural intentions towards ecosan fertilizer
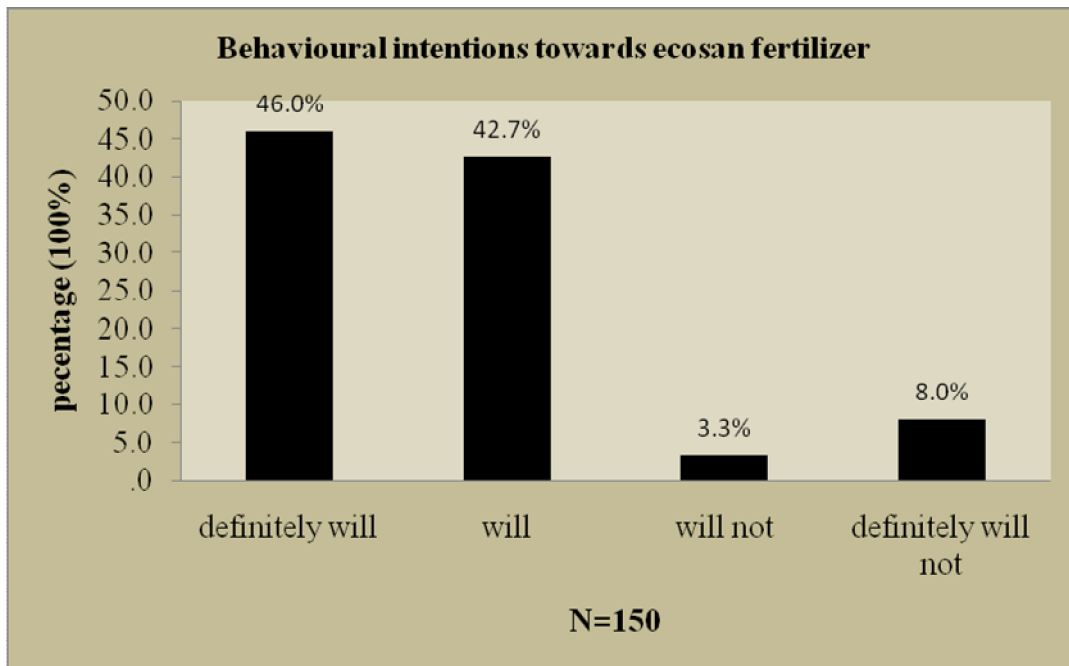
Source: Author's own data

Table 5:   Central tendencies and dispersion values for behavioural intentions

Variable	Mode	Mean	Median	Standard deviation
Behavioural Intentions	1	1.73	2.00	0.864

Source: Author's own data

Since the relationship between the individual independent variables and behavioural intention is going to be analysed in the following sections much emphasis will not be given to here.

5.2.2. Attitude

As attitude of the farmers was analysed, all the nine questions measuring it were first analysed if they were reliable using Cronbach's Alpha *(α)*. Cronbach's *α* value of 0.911 showed that they were highly reliable to be computed together to from one variable. Spearman's correlation *(rho)* was later calculated between attitude and behavioural intentions and a value of 0.801 with a *p* value of 0.000 at a significant level of α = 0.05 was got. This means there is a strong relationship between the attitude of the farmers and their intentions to use the ecosan fertilizer.

Analysis of the measure of central tendencies based on the new scale between 0 and 27 where 0 means highly positive and 27 means highly negative (this was the new scale got after the computation) resulted in the following figures: the mode value was "0" which means highly positive, the mean value was 6.16 which means the average respondent was positive and a median value of 5 which means 50% of the respondent falls within 0 and 5 whiles the other 50% falls above 5 where 5 itself is within the positive range. The standard deviation which was measuring the dispersion, gave a value of 6.477 which means the deviation of responses from the mean value is very high. This can be interpreted to mean that as the individual farmers did their personal evaluation of the positive and negative effect of their intentions to use ecosan fertilizer, they showed strong positive attitude. The tables below give the detailed values and the histogram that follows give the graphical view of the analyses.

Table 6:   Descriptive and reliability analysis values of each of the items for attitude

Items	Percentages of scale[195] (100%)				mean	Standard dev.	Corrected item-total correlation	Cron-bach's alpha if item del.
	1	2	3	4				
1. health implications	49	29	11	11	0.83	1.003	0.611	0.907
2. Ecosan fertilizer approach as good or bad way to reduce wastes in the society	78	14	3	5	0.36	0.788	0.603	0.907
3.Pleasant to use the fertilizer	54	36	3	7	0.63	0.855	0.833	0.892
4. Joy in using the fertilizer	46	45	0	9	0.73	0.874	0.861	0.889
5. Wise to use the fertilizer	68	23	2	7	0.49	0.857	0.843	0.891
6. Necessary to use the fertilizer	68	23	1	8	0.49	0.865	0.863	0.889
7.Expectations as whether ecosan fertilizer will increase yield of agriculture	52	31	5	12	0.77	0.999	0.577	0.909
8.Thought about customers expectations	43	20	6	31	1.26	1.298	0.451	928
9. Expression of overall attitude	56	34	3	7	0.63	0.863	0.819	0.893

Source: Author's own data

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[195] For the percentages of scale, 1=extremely positive, 2= positive, 3=negative, 4= extremely positive

Table 7: Central tendency, dispersion and reliability analysis values of the total items for attitude

Variable	Mode	mean	Median	Standard deviation	Cronbach's Alpha
Attitude	0	6.16	5	6.477	0.911

Source: Author's own data

Figure 12: The distribution of responses in relation to attitude

Attitude towards ecosan fertilizer

Mean =6.16
Std. Dev. =6.477
N =149
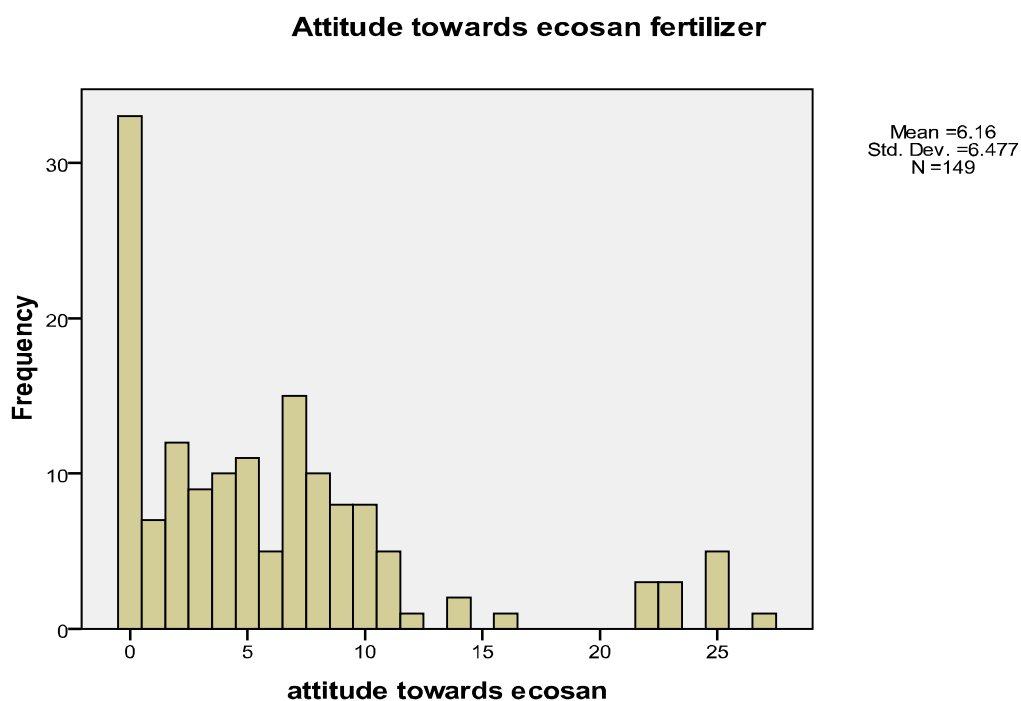
Source: Author's own

Table 8: Correlation between attitude and behavioural intentions

Variable	Spearman's correlation (rho)	Significance
Attitude	0.801	$P < 0.001$

Source: Author's own data

5.2.3.   Perceived behavioural control

There were two items for perceived behavioural control and they are about the indicators: ability to transfer fertilizer to the farm and confidence in applying the ecosan fertilizer in the farm. However, there were internal inconsistencies when reliability analysis was run. Cronbach's alpha value of 0.455 was the outcome which shows they cannot be computed together. Due to that, the item measuring the level of confidence will be used in representing perceived behavioural control in measuring its relationship with behavioural intentions since it is seen to give a general view of the perceived control of the individual. The remaining item will give supportive explanations. Analysing the ability of the farmers to transport the fertilizer to the farm, 58 (39%) said it will be very easy, 40 (27%) said it will be easy, 36 (24%) said it will be difficult and 16 (11%) indicated it will be very difficult. These responses were given as the farmers considered the transport cost, labour cost and ability to carry the fertilizer themselves considering the distance from the project site to the farm. From these, one can say that if the ecosan projects are closer to farming communities, it will help the farmers a lot.

The assessment about the level of confidence in applying the fertilizer in their farms, the majority were positive about it. 83 (55%) of the farmers indicated that they strongly agree to be capable, 40 (27%) of them agreed, 11 (7%) of them disagreed and 16 (11%) strongly disagreed. The table below shows the descriptive and reliability analysis values of the two items and explain further why they cannot be computed together.

Table 9:   Descriptive and reliability analysis values of each of the items for perceived behavioural control

Items	Percentages of scale (100%)[196]				mean	Standard deviation	Corrected item-total correlation	Cronbach's alpha if item deleted
	1	2	3	4				
4. Ability to transfer fertilizer to the farm	39	27	24	11	2	1.000	0.295	0
5. Confidence in applying the ecosan fertilizer in the farm	55	27	7	11	1.73	0.994	0.295	0

Source: Author's own data

As level of confidence was used to represent perceived behavioural control, its central tendencies and dispersions were analysed. The measures of central tendencies show a mode value of 1, median value of 1 and mean value of 1.73 which means on the average there are positive responses. The standard deviation value of 0.994 depict that the dispersion of responses from the mean value was very small. These analyses depict that there is a positive perceived behavioural control towards ecosan fertilizer. Analysing the relation between the perceived behavioural control and the behavioural intentions with Spearman's *rho* gave a significant value of 0.521 (p = 0.000, α = 0.05). This means there is a strong relationship between the respondents' level of control and their intention to use ecosan fertilizer. Comparing the attitude of the respondents to their perceived behavioural control in terms of correlations, one can say that the correlation co-efficient value of perceived behavioural control is lower. The table below shows the figures of these analyses.

[196] For the percentages of scale, 1=extremely positive, 2= positive, 3=negative, 4= extremely positive

Table 10:   Central tendency and dispersion values for perceived behavioural control

Variable	Mode	Mean	median	Standard deviation
Perceived Behavioural control	1	1.73	1.00	0.994

Source: Author's own data

Table 11:   Correlation between perceived behavioural control and behavioural intentions

variable	Spearman's rho	Significance
Perceived behavioural control	0.521	$p < 0.001$

Source: Author's own data

5.2.4. Subjective norm

To get one item for subjective norm, three items were computed together. The items computed together were on the indicators: Opinion about support from community members, opinion about support from family and close friends and opinion about existing religious and traditional disapproval or approval. Opinion as to whether other farmers will intend to use the ecosan fertilizer or not was not added because it had a *Corrected Item- Total Correlation* of 0.248 which means it does not correlate with the total alpha value. The minimum value for *Corrected Item- Total Correlation* should be 0.3.[197] Moreover, when it is added, the Cronbach's alpha value of 0.615 is realised which is not acceptable. When it is deleted as the *Alpha if Item Deleted* value for it shows in table 12, the Cronbach's alpha for the other three items moves to 0.704 which shows that they are reliable. One may realise that opinion about existing religious and traditional disapproval or approval also had a *Corrected Item- Total Correlation* of 0.206. However, it was added to the computation because when it is deleted, the other

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[197] Field, Andy, 2005, p.672

two items left do not reach the minimum alpha value of 0.7 but when it added, then the minimum is attained. The table below gives the details of these analyses and other descriptions.

Table 12:   Descriptive and reliability analysis values of each of the items for subjective norm

Items	Percentages of scale (100%)[198]				mean	Standard deviation	Corrected item-total correlation	Cronbach's alpha if item deleted
	1	2	3	4				
1. Opinion as to whether other farmers will intend to use the ecosan fertilizer or not	45	31	5	19	1.98	1.120	0.248	0.704
2. Opinion about support from community members	15	21	58	6	1.52	0.810	0.596	0.404
3. Opinion about support from family and close friends	19	21	53	7	1.49	0.880	0.635	0.353
2. Opinion about existing religious and traditional disapproval or approval	81	11	3	5	0.26	0.663	0.206	0.654

Source: Author's own data

A measure of central tendency of subjective norm showed a median value of 4, mode value 4 and mean value of 3.29 on a scale with scores ranging from 0 to 9. Towards

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[198] For the percentages of scale, 1=extremely positive, 2= positive, 3=negative, 4= extremely positive

zero means extremely positive and towards 9 means extremely negative. These central tendencies show that on the average there are relatively positive subjective norm of the respondents towards their intentions to use the fertilizer. The standard deviation show a value of 1.853 meaning the dispersion from the mean value is very small. The table and histogram that follows gives a tabular and graphical view of the central tendencies and dispersion.

Table 13:   Central tendency, dispersion and Cronbach's alpha values for subjective norm

Variable	Mode	mean	Median	Standard deviation	Cronbach's alpha
Subjective norm	4	3.29	4.00	1.853	0.704

Source: Author's own data

Figure 13:   The distribution of responses in relation to subjective norm
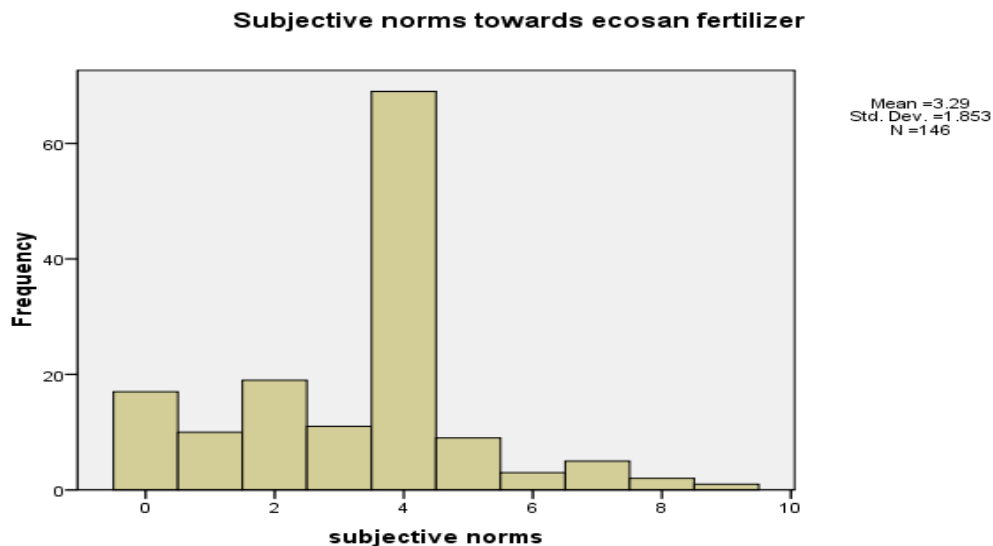
Source: Author's own data

As the subjective norm was analysed in relation to behavioural intentions with Spearman's *rho*, the correlation was found to be significant (rho = 0.433, *p* = 0.000, α = 0.05). It shows a moderate-strong relationship between the subjective norm and the

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intentions of the farmers to use ecosan fertilizer. These values are shown in the table below.

Table 14:   Correlation between subjective norm and behavioural intentions

variable	Spearman's rho	Significance
Subjective norm	0.433	p < 0.001

Source: Authors own data

5.3.   The three independent variables together as predictors

To analyse the hypothesis where three independent variables are exerting influence on one dependent variable, multiple regression was used. The multiple regression show an R Square value of 0.730 and an adjusted R Square value of 0.724 ($p = 0.000$ at a significant level: α= 0.05). This means that about 73% of the intentions of the farmers to use the ecosan fertilizer can be explained by their attitude, perceived behavioural control and subjective norms. The other 28% can be explained by other factors. Also, none of the independent variables and the dependent variable used has a correlation co-efficient value equal to zero as shown by the significance value. The table below shows the R, R Square and the adjusted R square values of the multiple regression.

Table 15:   R, R Square and adjusted R square values for the three independent variables

R	R Square	Adjusted R Square	Significance
0.855	0.730	0.724	0.000

Source: Author's own data

Considering the standardised coefficients which assess the contribution of each independent variable to the dependent variable in the multiple regression show that attitude has the highest contribution (0.714) followed by perceived behavioural control (0.169) and then subjective norms (0.066). The significance test on the other hand show attitude is significant with a p=0.000 at significance level of α=0.05. Perceived behavioural control is also significant (p=0.002, α=0.05). However, subjective norm is not significant (p=0.182, α=0.05). The table below show this analysis.

Table 16:   Coefficients for the three independent variables

Variables	Unstandardised co-efficeints (B)	Standardized co-efficients	p value (α= 0.05)
Attitude	0.91	0.714	0.000
Perceived behavioural control	0.137	0.169	0.002
Subjective norms	0.29	0.66	0.182

Source: Author's own data

To investigate why the multiple regression analysis for the three independent variables had an insignificant standardised coefficient for subjective norm, another multiple regression was done based on only two independent variables and these were with attitude and perceived behavioural control. This new regression shows a higher value for R (0.857), R square (0.734) and adjusted R square (0.731) with p=0.000 at significance level of α= 0.05. The standardised coefficients showed higher values for attitude (0.774). These are shown in the tables below.

Table 17:   R, R square and adjusted R square values for the two independent variables

R	R Square	Adjusted R Square	Significance
0.857	0.734	0.731	0.000

Source: author's own data

Table 18:   Coefficients for the two independent variables

Variables	Unstandardized co-efficeints (B)	Standardized co-efficients	*p* value (α= 0.05)
Attitude	0.101	0.774	0.000
Perceived behavioural control	0.117	0.136	0.010

Source: Author's own data

From this analysis, one can assume that there is either a specification error or multicollineality problem. Under specification error, when an irrelevant independent variable is added to the multiple regression analysis, the efficiency of the relevant variables is reduced.[199] This is seen in the three-predictor and two-predictor multiple regression analyses where the standardised coefficient of attitude rose from 0.714 to 0. 774 when subjective norm was excluded and the adjusted R squared value increased from 0.724 to 0.731.   It was also explained under specification error that the more correlated a relevant variable is to the irrelevant variable, the less efficient the estimate of the relevant variables will be.[200] This is explained in the analysis where the Spearmans' correlation *(rho)* analysis among the three independent variables showed that attitude is more correlated with subjective norms (0.388) than perceived behavioural control and subjective norms (0.264). The problem of multicollinearity on the other hand occurs when there is a partial or perfect correlation among the independent variables as discussed under the criticisms of TPB. In that section, it was explained that when there is a partial collinearity, the significance test of the regression is affected. This problem can be linked to the criticism laid again TPB that it has a statistical problem of multicollineality when it comes to attitude and subjective norm. Considering these explanation, one can say that the problem at hand is more of multicollinearity than specification error since subjective norm has been a relevant variable in many studies. Moreover the Spearman's rho correlation show subjective norm to be significant and the multiple regression for the three independent variables

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[199] Berry, William, Dale and Feldman, Stanley, 1985, p. 20
[200] Ibid

has R square value which is significant. Discussion and conclusions can therefore be drawn since it is argued that multicollinearity becomes a great problem if the purpose of the regression is for explanation and not for prediction purposes.[201] The purpose of the study is to predict intentions and for that matter, the statistical problem is not of great concern.

5.4. Using some demographic variables as predictors of intentions

An attempt was made to find out if demographic variables like sex, age and educational level are also important determinants influencing the intentions of the farmers towards ecosan fertilizer. Since age and educational level and sex were measured categorically, they were converted into dummy codes and regressed one by after the other with the three main independent variables towards intentions. It was realised that age brought about only 0. 005 change in R square value (p= 0.749, α= 0.05) which is not significant. Educational level was also not significant as it brought about 0.004 change in R square value (p= 0.741, α= 0.05). Sex brought about 0.002 change in R square value (p= 0.283 at α= 0.05) which is also insignificant. The tables below present the details.

Table 19:   R, R square and adjusted R square values for age, sex and level of education as predictors

Variables	R	R Square	Adjusted R square	R square change	Significance
Three main independent variables	0.855	0.730	0.724	0.730	0.000
Age in addition	0.858	0.735	0.720	0.005	0.749
Level of education in addition	0.857	0.734	0.720	0.004	0.741
Sex in addition	0.856	0.732	0.725	0.002	0.283

Source: Author's own data

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[201] Berry, William and Feldman Stanley, 1985, p.41

Table 20:   Coefficients for age, sex and level of education

Variables	Unstandardised coefficient	Standardised coefficient	p value ($\alpha= 0.05$)
Age dummy 1	0.079	0.036	0.657
Age dummy 2	-0.093	-0.045	0.597
Age dummy 3	-0.054	-0.030	0.749
Age dummy 4	-0.052	-0.026	0.765
Age dummy 5	-0.035	0.012	0.859
Level of education dummy 1	0.087	0.048	0.704
Level of education dummy 2	0.282	0.069	0.316
Level of education dummy 3	0.092	0.057	0.682
Level of education dummy 4	0.167	0.084	0.469
Sex dummy 1	0.077	0.047	0.283

Source: Author's own data

Considering the study of Danso et al on the willingness to pay for the co-compost in Kumasi, apart from gender differences which was not significant in determining the willingness to pay, age and level of education were significant. This is not the case in this study where sex, age and level of education are all not significant in determining the intentions of the farmers. Although gender was not significant in this study and that of Danso et al it was significant in the study of Ekere et al. To elaborate these findings in relation to other studies, the hypotheses and theoretical background of this study, the next section discusses the findings of this study.

5.4.   Discussion

This section as indicated earlier seeks to discuss the findings of the study in relation to the hypothesis set for the study and as well as see the relationship between the findings

of this study and other studies discussed in the paper which used the theory of planned behaviour or were based on ecosan.

Starting the discussion with the relationship of the individual independent variables and the dependent variable, a first look is made on the attitude and intentions relationship. The findings of the study show that there is a strong and positive relationship between attitude and intentions of the farmers to use ecosan fertilizer. This confirms the extended hypothesis that *the more positive attitude the farmers may have the more they will intend to use ecosan fertilizer in agriculture.* That is in terms of attitude; the farmers intend to use ecosan fertilizer. Attitude-behavioural intention strong relationship has been realised in many studies. For example, the study of Chan and Fishbein on women intentions to tell their partners to use condom and the study of Blanchard et al on the intentions to engage in physical activities among African Americans and Caucasian women realised that attitude was the highest predictor of intentions. Moreover, the meta-analytic study of Armittage and Conner to review the efficacy of TPB realised attitude was the highest predictor in many studies which used TPB as theoretical background. In this study, perceived behavioural control has the second highest and positive relationship with the intentions of the farmers to use ecosan fertilizer. It also therefore confirms the extended hypothesis that *the higher the perceived behavioural control of the farmers the more they will intend to use ecosan fertilizer in agriculture.* In this study, it was high and so in terms of perceived behavioural control, the farmers intend to use ecosan fertilizer. In other studies, perceived behavioural control has been found to be almost equally influential as attitude. The studies of Johnston and White and Blanchard et al are examples. Subjective norm is found to have moderate but positive relationship with the intentions in this study. Nevertheless, the extended hypothesis that *the more positive subjective norm may exist for the farmers the more they will intend to use ecosan fertilizer in agriculture* is confirmed since there was positive subjective norm which motivate them to use the fertilizer. Notwithstanding the less influence of subjective norm in this study, other studies found it to be the highest predictor or sometimes equally influential like attitude and perceived behavioural control. These were in the case of the studies of Rise, Astrøm and Sutton to predict intentions to use dental floss among adolescents and Fekadu and Kraft on the intentions of women to use contraceptive. The inclusion of variables like sex, age, level of education as predictors were not significant, but other studies with different theoretical background found them

to be significant. These were in the case of Danso et al, and Ekere et al. From all these, one can say that the significance and the strength of the predictors depend on the focus and target group of the study and the theoretical framework.

To have a broader view of the three independent variables together, the multiple regression with the three independent variables showed an R square value of 0.73 which is high means 73% of the variation on the dependent variable is caused by them. With that, one can say that the hypothesis of the thesis that *the attitude, subjective norms and the perceived behavioural control determine the behavioural intentions of the farmers to use ecosan fertilizer in agriculture* analysis is confirmed. This as well answers the research question of the study which is: *what factors determine the intentions to use ecosan fertilizers in agriculture?* By saying that attitude, subjective norm and perceived behavioural control are factors that determine the intentions of farmers to use ecosan fertilizer in agriculture.

Studies show that there is a strong correlation between intentions and behaviour and so it is assumed that if further studies are carried out on this research it will be realised that the farmers are actually engaging themselves in the behaviour of using the fertilizer. The general conclusions and recommendations of the paper can be found on the next chapter.

6.   Conclusions and Recommendations

The desire to manage the increasing solid wastes and faecal sludge due to rapid urbanisation and to improve soil fertility has led to the implementation of the ecosan projects on pilot phase in Ghana. This is to bridge the gap between sanitation and agriculture. Considering perceptions that exist about wastes in general and faecal sludge in particular, it was seen necessary to assess factors that will determine the intentions of farmers towards the usage of the ecosan fertilizer that are produced from the two forms of wastes: municipal solid wastes and faecal sludge. Farmers were chosen because they are the core group when it comes to the usage of the fertilizer in farming. The fact that the production and usage of the ecosan fertilizer has a background on health led to the choosing of a theoretical framework from health behaviour models. The Theory of Planned Behaviour was particular chosen because it has some social focus where norms existing in the society from the individual's perspective is taken into consideration. To undertake the study, primary and secondary data was used. Questionnaire was administered in Kumasi because a pilot project was being implemented there and the existence of the project has made more people aware of the concept and might have thought of it for some time. Although the name ecosan fertilizer was used frequently in this paper, one may also realise that other terms like co-compost and *comlizer* were as well used along side. This is due to the processes that the production of the fertilizer is still going through. All the same, ecosan fertilizer was only adopted in this study to capture all these differences under one name.

As the study set out to identify factors that will determine the intentions of the farmers to use the ecosan fertilizer, the empirical findings show that attitude, subjective norm and perceived behavioural control are influential factors that determine the intentions of the farmers. Attitude was the highest influential factor whiles subjective norm was the less influential factor. This means that the personal interest, personal evaluation of the farmers of the consequences of the usage of the fertilizer is more important than the farmers' perception about the influence that come from important people as well as the easiness or difficulty of the farmers in using the fertilizer. Moreover, the perceived control of the farmers in using the fertilizer is also more influential than the pressure put on the individual farmer by important others. Another important finding was that the attitude, subjective norm and perceived behavioural control were all positive which means that based on this study the farmers intend to use the fertilizer made from the

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municipal solid waste and faecal sludge. Another point that came up strongly in the literature review is that the three variables or others become significant or not based on the target group, other methodological approach chosen and the theoretical framework.

Based on the findings of the study the following are recommended for actions.

- A Research should be carried out in any part of the country where ecosan is to be promoted to find out if the farmers have positive attitude, subjective norm or perceived behavioural control towards it or not since there are cultural and regional variations. If they are found to be positive, then it is possible for the ecosan project to be carried out because the farmers will have positive intentions to use the fertilizer.

- More sensitization programmes from government and other implementing organisations of ecosan should be organised for the farmers and other stakeholders. This will enable them to know the benefits of the whole concept of ecological sanitation hence reducing negative perceptions and to improve the level of confidence in using the fertilizer in farming. Since it came out clearly that not all the respondents have positive attitude, subjective norm and perceived behavioural control since there was no 100% positive responses. Again, not all the respondents were aware of ecosan.

- Special attention should be given to attitude in researches and sensitization programmes since it has the strongest influence on the intentions of the farmers to use the fertilizer. This means the personal expectations or interest in terms of evaluation of consequences of the farmers is very crucial to their decision to use the fertilizer. If a research is carried out and attitude is found to be low, then more sensitisation programmes should be carried out to boost the attitude.

- The ecosan projects should be situated closer to farming communities so as to reduce transport cost for the farmers to ensure further improvement of the perceived behavioural control of the farmers. There should be support from government and other external agencies. The government can enter into partnership with private organisations to set up this composting site at vantage point to help the farmers improve soil fertilizer whilst keeping the environment

clean. Even if that is not possible, individual farmers can be encouraged to set up their own composting sites.

- There is a need for a further research on this study to observe if the farmers are really using the fertilizer since that was not covered in this study. The intentions of the farmers interviewed were positive so it is expected that these intentions will reflect in their behaviour.

- In applying TPB as the theoretical framework to predict intentions or behaviour should take the target group, multiple items for the variables and other methods into consideration for they influence the result of the study.

List of References

Adamtey, Noah (2010): Enrichment of recycled waste for peri-urban maize cultivation and its effects on the soil environment. PhD thesis, School of Research and Graduate studies, University of Ghana, Legon

Adamtey, Noah, et al (2008): Turning wastes into a fertilizer. In Sandec News, vol. 9, p.16: http://www.eawag.ch/medien/publ/sandecnews9.pdf. 06/07/2010

Adamtey, Noah, et al (2009a): Economic impact of N-enriched excreta- based co-compost (*comlizer*) on maize production in Ghana. In Sandec news, vol. 10, p. 17: http://library.eawag-empa.ch/sandecnews/sandecnews_10.pdf. 06/07/2010

Adamtey, Noah, et al (2009b): Production and storage of N-enriched co-compost. In Waste Management, Vol. 29, Issue No. 9, pp. 2429-2436

Ajzen, Icek; Fishbein, Martin (1980): Understanding attitudes and predicting social behaviour. New Jersey (Prentice-Hall, Inc)

Ajzen, Icek (1988): Attitudes, personality, and behaviour. Milton Keynes (Open University Press)

Allen, Felicity (1998): Health psychology: Theory and practice. Australia-St. Leonards (Allen & Unwin Pty ltd)

Argyrous, George (2008): Statistics for research: with a guide to SPSS. London (SAGE Publications), second edition

Armitage, Christopher, J.; Conner, Mark (2001): Efficacy of the theory of planned behaviour: A meta-analytic review. In British Journal of Social Psychology, vol. 40, pp. 471-499

Arno, Rosemarin, et al (2008): Pathways for sustainable sanitation: Achieving the Millennium Development Goals. London (IWA publishing)

Bandura, Albert (1969): Principles of behaviour modification. USA (Holt, Rinehart and Winston, Inc.)

Beale, D.A.; Manstead, A.S.R. (1991): Predicting mothers' intentions to limit frequency of infants' sugar intake: Testing the theory of planned behaviour. In Journal of Applied Social Psychology, Vol. 21, Issue 5, pp. 409-431

Berry, William, Dale; Feldman, Stanley (1985): Multiple regression in practice. California-London-New Delhi (SAGE Publications, Inc.), Series number 07-050.

Black, Maggie; Fawcett, Ben (2008): The last taboo: Opening the door on the global sanitation crisis. London-Sterling (earthscan).

Blanchard, Chris, et al (2008): Understanding physical activity behaviour in African American and Caucasian college students: An application of the theory of planned behaviour. In Journal of American college of health, vol. 56, Issue No. 4, pp. 341-346

Bohner, Gerd; Wänke, Michaela (2002): Attitudes and attitude change. East Sussex-New York (Taylor and Francis group).

Brannen, Julia (1992): Mixing methods: qualitative and quantitative research. USA (Avebury).

Capra, Fritjof (1996): Ecology, community and agriculture. USA-California (Centre for ecoliteracy). http://www.goldenhour.org/library/ecology, community, and ag.pdf, 28/07/2009

Chan, Darius, K-S.; Fishbein, Martin (1993): Determinants of college women's intentions to tell their partners to use condom. In Journal of Applied Social Psychology, Vol. 23, Issue No. 18, pp.1455-1470

Conner, Mark; Normann, Paul (2007): Predicting health behaviour. Maidenhead-Berkshire (Open University press), second edition

Danso, G.; et al, (2006): Estimating the demand for municipal waste compost via farmers' willingness-to-pay in Ghana. In waste management, vol. 26, issue 12, pp. 1400-1409

De Silva, N.K. (2007): Multi-criteria analysis of options for urban sanitation and urban agriculture: case study in Accra (Ghana) and in Lima (Peru). Dissertation, UNESCO-IHE, Institute of water education.
http://www2.gtz.de/Dokumente/oe44/ecosan/nl/en-kalyani-ihe-thesis-2007.pdf. 06/07/2010

Diamond, Ian; Jefferies, Julie (2001): Beginning statistics: An introduction for social scientists. London-Thousand Oaks-New Delhi (SAGE publications).

Diaz, Luis, F. (2006): Landfilling of municipal waste and the end of the aftercare period. In waste management, vol. 26, Issue no. 12 pp. 1325-1326

Dijkema, G. P. J.; Reuter, M. A.; Verhoef, E.V. (2000): A new paradigm for waste management. In Waste Management, vol. 20, issue no. 8, pp. 633-638

Eagly, Alice, H.; Chaiken, Shelly (1993): The psychology of attitude. Florida (Harcourt Brace Jovanovich, Inc.)

Ekere, William; Mugisha, John; Drake, Lars (2009): Factors influencing the waste separation and utilization among households in Lake Victoria crescent, Uganda. In Waste Management, vol. 29, issue no. 12, pp. 3047-3051

Esrey, Steven et al (2001): Closing the loop: Ecological sanitation for food security. Mexico (Swedish International Development Cooperation Agency). http://www.ecosanres.org/pdf_files/closing-the-loop.pdf. 25/01/2010.

Fekadu, Zelalem; Kraft, Pal (2002): Expanding the theory of planned behaviour: The role of social norms and group identification. In Journal of health psychology, vol. 7, issue no. 33, pp. 33-43

Field, Andy, P. (2005): Discovery statistics using SPSS: And sex, drugs and rock 'n' roll. London (SAGE Publications)

Fishbein, Martin; Ajzen, Icek (1975): Belief, attitude, intention and behaviour: an introduction to theory and research. Philippines (Addison-Wesley Publishing Company, Inc.)

Geller, G.; Laryea, S. (2008): Cycles in the ecological development of Valley View University, Accra, Ghana. 33rd WEDC International conference, Accra, Ghana: http://www2.gtz.de/Dokumente/oe44/ecosan/en-cycles-ecological-development-2008.pdf. 06/07/2010

German Federal Ministry for Economic Cooperation and Development-BMZ (1995): Environmental handbook: documentation on monitoring and evaluating environmental impact. GTZ-Eschborn (Friedrich Vieweg $ Sohn), Vol. 1

Ghana Statistical Service, (2005): Health, nutrition and environment statistics report: http://www.statsghana.gov.gh/docfiles/health_nutrition_and_environment_report_2005.pdf. 06/07/2010

Ghana Statistical Service (2008): Ghana living standards survey. Report of the fifth round (GLSS 5): http://www.statsghana.gov.gh/docfiles/glss5_report.pdf. 06/07/2010

Gibbons, Frederick, X. et al, (1998): Cognitive antecedents to adolescents' health risk: Discriminating between behavioural intentions and behavioural willingness. In Psychology and health, vol. 13, issue 2, pp.319-339

Gomez, A. (1998): The evaluation of compost quality. In trends in Analytical Chemistry, vol. 17, issue, 5, pp. 310-314

Hernández, T.; et al (2006): Changes in organic matter composition during composting of two digested sewage sludges. In Waste Management, vol. 26, issue no. 12, pp. 1370-1376

International Program for Development Evaluation Training (IPDET) – 2007: Handbook: Module 9, sampling: www.worldbank.org/oed/ipdet/modules/M_09-na.pdf. 12/07/2009.

IWMI&SANDEC (2002): Composting of faecal sludge and solid waste: preliminary recommendations on design and operation of co-composting plants based on the Kumasi pilot investigations. www.eawac.ch. 20/10/2010

Jiménez, Emeterio, Iglesias; Garcia, Victo, Perez (1989): Evaluation of city refuse compost maturity: A review. In Biological wastes, vol. 27, pp.115-142

Johnston, Kim, L.; White, Katherine, M. (2003): Binge-drinking: A test of the role of group norms in the theory of planned behaviour. In Psychology and Health, Vol. 18, Issue no. 1, pp. 63-77

Kalton, Graham (1983): Introduction to survey sampling. Newbury Park-London - New Delhi (SAGE publications), series no. 07-035

Kerlinger, Fred, N.; Pedhazur, Elazar, J. (1973): Multiple regression in behavioural research. USA (Holt, Rinehart and Winston, Inc.)

Ketibuah, E.; et al: Comparative analysis of household waste in the cities of Stuttgart and Kumasi: Options for wastes recycling and treatment in Kumasi. http://www.codata.org/04conf/papers/Ketibuah-paper.pdf. 29/12/2009

Kleiss, Torsten (2008): Institutional arrangement for municipal solid waste combustion projects. Weimer (Bauhaus-Universitaet)

Larbi, Eugene (2006): Sanitation in Ghana: a paper on the current state of sanitation, in Ghana, the constraints and the on-going efforts to improve the situation. Ghana-Accra (DANIDA International Development Agency): http://www.danidadevforum.um.dk/NR/rdonlyres/387A6438-E4CB-44AB-999D-AA506DE302EE/0/2006WP_SanitationGhana.doc. 06/07/2010

Lewis-Beck, Michael, S. (1980): Applied regression: An introduction. Park-London - New Delhi (SAGE publications), series no. 07-022.

Lewis-Beck, Michael, S. (1995): Data analysis: An introduction. Newbury Park-London - New Delhi (SAGE publications), series no. 07-103.

Moreland, Richard, Identification. http://www.thefederationonline.org/events/Briefings/2006_SPSP_DHS/SPSP_Moreland_Sum.pdf. 20/12/2009

Moskowitz, Gordon, B. (2005): Social cognition: Understanding self and others. New York (The Guilford Press)

Nathanson, Jerry, A. (2000): Basic environmental technology: water supply, waste management, and pollution control. New Jersey-Upper Saddle River (Princetice-Hall, Inc.), third edition.

Nkansah-Boadu, Frank (2006): Socio-cultural and economic factors influencing faecal sludge use in agriculture in the Manya Krobo district. Dissertation, Kwame Nkrumah University of Science and Technology, College of Engineering, Kumasi

Ogden, Jane (2007): Health psychology: A textbook. England-Maidenhead (Open University press), fourth edition

Olofunke, Cofie; Kone, Daulaye (2008): Co-composting of faecal sludge and solid waste for urban agriculture, Africa/Ghana/ Kumasi. Case studies of sustainable sanitation (SuSanA). http://www.susana.org/images/documents/06-case-studies/en-susana-cs-ghana-kumasi-cocomposting-2009.pdf. 27/01/2010

Pacey, Arnold (1980): Rural Sanitation: Planning and appraisal. London- convent Garden (Intermediate Technology Publications Ltd).

Panesar, Arne; Bischoff, Jürgen (2008): Sustainable sanitation in India: Examples from Indo-German Development Cooperation. Germany- Eschborn (GTZ): http://www.gtz.de/en/dokumente/en-ecosan-sustainablesanitation-india-2008.pdf. 06/ 07/2010

Pfohl, Jake (1997): Towards better programming: A sanitation handbook. New York (UNICEF/Program division and water, environment and sanitation publication) first edition, series no. 3

Pinnekamp, Johannes (2007): Advanced sanitation: Selected papers from the conference on advanced sanitation, held at Aachen, Germany, 12-13 March 2007. Germany- Aachen (IWA publication)

Pratkanis, Anthony, R.; Breckler, Steven, J.; Greenwald, Anthony, G. (1989): Attitude, structure and function. New Jersey (Lawrence Erlbaum Associates, Inc.), Third edition.

Rabbani, K. R.; et al. (1983): Composting of domestic refuse. Bangkok (Environmental sanitation centre), series no. 10/11

Reynolds, Henry, T. (1984): Analysis of nominal data. Newbury Park (SAGE publications), second edition

Ringelband, U.; Schlag, G.; Schmoll, O. (2000): Water, sanitation and health: Resolving conflicts between drinking water demands and pressures from society's wastes. London (IWA publishing)

Rise, Jostem; Astrøm, Anne, Nordrehaug; Sutton, Stephen (1998): Predicting intentions and use of dental floss among adolescents: An application of the theory of planned behaviour. In Psychology and Health, Vol. 13, Issue no. 2, pp.223-236

Roskam, Edward, Elias (1968): Metric analysis of ordinal data in psychology: Models and numerical methods for metric analysis of conjoint ordinal data in psychology. Dissertation, Leiden University

Strauss, Martin et al, (2003): Co-composting of faecal sludge and municipal organic waste: A literature and state-of-the-knowledge review. www.eawac.ch. 20/10/2010

Schwarzer, Ralf (1992): Self-Efficacy: Thought control of action. Washington-Philadelphia-London (Hemisphere Publishing Corporation).

Senesi, N. (1989): Composted materials as organic fertilizers. In the science of the total environment, vol. 81/82, pp.521-542

Sullivan, John, Lawrence; Feldman, Stanley (1979): Multiple indicators: an introduction. Beverly Hills (SAGE publications), series no. 07-015

Sustainable Sanitation Alliance (2008): Towards more sustainable sanitation solutions. Version 1.2: http://www.susana.org. 06/07/2010

Thurstone, Louis, L.; Chave, E. J. (1929): The measurement of attitude: A psychological method and some experiments with a scale for measuring attitude towards the church. USA (The University of Chicago Press)

Townsend, Collin, R.; Begon, Michael; Harper, John, L. (2008): Essentials of ecology. UK-USA-Australia (Blackwell publishing), third edition

UNEP/GPA-UNESCO-IHE-UN/DOALOS (2004): Improving municipal wastewater management in coastal cities: A training manual for practitioners. The Hague (Train-Sea-Coast GPA), Version 1: http://esa.un.org/iys/docs/san_lib_docs/tsc_training_manual_wastewater_english .pdf. 06/07/2010.

Urwibutso, Noëlla, Joyeuse, 2008: Making sanitation matter: Analysis of the sanitation issues in Rwanda and the possibility for introducing ecological sanitation in Kigali city. Dissertation, UNESCO-IHE, Institute for Water Education: http://www2.gtz.de/Dokumente/oe44/ecosan/en-making-sanitation-matter-2008.pdf. 06/07/2010

Vodounhessi, Anselme; Von Muench, Elisabeth (2006): Farmers and households orientation and effective decentralization to make faecal sludge management integrated part of ecosan approach in Kumasi, Ghana. http://www.alianzaporelagua.org/sermario/pdf/en_households_ecosan.pdf. 18/01/2010

Weiner, Jacob (1998): Two meaning of ecology. KVL, Mosaik 6(6), 12-13. http://www.jacobweiner.dk/Site/Publications_files/2meanings.pdf. 28/07/2009

Werner, Christine et al (2003): An ecosan source book: For the preparation and the implementation of ecological sanitation projects. (GTZ publications), 2nd Draft version: http://www2.gtz.de/dokumente/bib/05-1170.pdf. 06/07/2010

Winblad, Uno and Simpson-Hébert, Mayling (ed. (s.); 2004): Ecological sanitation: Revised and enlarged edition. Stockholm (Stockholm Environment Institute): http://www.bvsde.paho.org/bvsacd/cd66/Ecological_Sanitation.pdf: 06/07/2010.

Yara fertilizer industry handbook (2009). http://www.yara.com/doc/2009%20FIH.pdf. 19/01/2010

Annex

Annex I.   Questionnaire

Serial number of paper: ....

Good morning/afternoon Sir/Madam. I am Joyce Ekuful and I am doing a research on behavioural Intentions towards ecological sanitation. It is part of my studies at the Institute of Development Research and Development Policy, Bochum Germany. Is it possible for me to take 10 minute of your time? I promise that any information you provide will be used for the stated purpose and nothing else. Thank you very much.

Date: _____

Place of interview: _____

Time interview started: _____ Time interview finished: _____

Interviewer: _____

Introductory questions

1.   Have you ever heard of the ecological sanitation (ecosan) project where human excreta and solid wastes are converted into fertilizer before?

        1. Yes   2. No

        If no, do not conduct the interview. Move to another person

2.   Are you already using this fertilizer in your farm?

        1. Yes   2.No

        If yes, do not conduct the interview. Move to another person

3   Where is your farm?

      1.   In town

      2.   At the outskirt of town

      3.   In a rural area far away

4.   How large is your farm?

      1.   Less than a hectare

      2.   one hectare

      3.   Two hectares

      4.   More than two hectares

5.   What kind of crops do you produce?

      1.   Vegetables (tomatoes, pepper, lettuce, cabbage, okro, etc)

      2.   Cereals (maize, wheat, rice)

      3.   Tubers (yam, cassava, cocoyam)

      4.   Cash crops (cocoa, cashew, coffee)

6.   From where did you learn about ecosan?

      1.   Media (radio, Television, Daily papers)

      2.   seminars/training courses

      3.   Friends and relatives

      4.   Other (specify)...

7.   When did you get to know about ecosan?

      1.   Some weeks ago

      2.   Some months ago

3.   A year ago

4.   Two years and above

8.   Do you know how this fertilizer is prepared?

1.   Yes   2.   No

If yes, continue from question 9.   If no, move to question 10

9.   Explain how it is prepared.

....

....

Indicators for perceived behaviour control

10.   How do you assess your ability to transport this fertilizer to the farm if you intend to use it?

Very easy   1 2 3 4   very difficult

11.   What is your reason for your answer to question 10?

....

....

12.   In your opinion, do you agree, rather agree, rather disagree or disagree to this statement: 'I feel confident that I can apply this fertilizer at all times in my farm during every planting season when I want to use it.

Strongly agree   1 2 3 4   strongly disagree

Indicators for subjective norms

13.   In your own opinion, is it very likely, likely, unlikely or very unlikely that other farmers use this fertilizer in their farms?

Very likely   1 2 3 4   Very unlikely

14. What do you think about how many persons in your community will support you in using ecosan fertilizer?

    1   none

    2   Few

    3   Many

    4   all

15. What do you think how many persons who are important to you (family members and close friends) will support you intend using ecosan fertilizer?

    1   none

    2   Few

    3   Many

     4   all

16. What do you think about this statement: The teachings of my religious group will strongly approve, approve, disapprove or strongly disapprove of my reusing human and domestic waste fertilizers in my farm.

    Strongly approve   1 2 3 4   strongly disapprove

Indicators for attitude

17. In your opinion do you see any danger for your health in using this ecosan fertilizer as you prepare and use it?

    No danger at all   1 2 3 4   high danger

18. Do you see this fertilizer as a very good, good, bad or very bad way to reduce wastes and dirt in the society?

    Very good   1 2 3 4   very bad

19.　Will you expect that the fertilizer increase the yield of agricultural produce as compared with chemical fertilizer as you apply them in your farm?

Very much　　　　1 2 3 4　　　not at all

20.　What do you think about this statement: my customers will strongly approve, approve, disapprove or strongly disapprove of my using ecosan fertilizer in my farm.

Strongly approve　　1 2 3 4　　strongly disapprove

21.　In all can you say that your attitude towards the use of ecosan fertilizer is..................?

Extremely positive　　1 2 3 4　　extremely negative

Indicators for behaviour intentions

22.　What is your opinion about this statement: I will use ecosan fertilizer (made of human waste) in the future.

Definitely will　　　　1 2 3 4　　definitely will not

Interviewee background information

23.　Sex of respondent
　　1. Female　　　　　　　　2. Male

24.　Which age group do you fall under?
　　1. Under 16　　　　　　5. 36-45
　　2. 16-20　　　　　　　　6. 46-55
　　3. 21-25　　　　　　　　7. 56-65
　　4. 26-35　　　　　　　　8. 66 or above

25.   What is your marital status?

    1. Single   3. Divorced

    2. Married   4. Widow

26.   What Level of Education have you reached at the moment?

    1. No education   4. Secondary education

    2. Non-formal education   5. Tertiary education

    3. Elementary education   6. Other _____

27.   What is your family size? (*Those who share your house*)

28.   What is your religion?

    1. Christian   2. Muslim

    3. Traditional African religion   4. No religion

    5. Other

29.   To which ethnic group do you belong?

    1. Akan   4. Hausa

    2. Ewe   5. Guan

    3. Ga   6. Other (specify).......................

Annex II.   Time table for field research

Activity	location	1st week 5th Aug.	2nd week 10th - 14th Aug	3rd week 17th- 21st Aug	4th week 24th- 28th Aug.	5th week 31st Aug- 4th Sept.	6th week 7th- 11th Sept.	7th week 14th- 18th Sept.	8th week 21st- 25th Sept.	9th week 28th- Sept- 2nd Oct.	10th week 5th- 9th Oct.
		WEEKS: nine weeks for the field work.									
Flight	to Ghana	xxxx									
Initial contact with implementing institutions of the project and heads of farmers association	Project site and offices in Kumasi metropolis		xxxx								
Search for research assistant and a guide	Research area			xxx							
Pre-testing of questionnaire	Research area			xxx							
Filling of questionnaire with farmers	Research area				xxx	xxx	xxx	xxx			
Interviews with implementing institutions	Research area								xxx		

Secondary data search	Library										xxx	
Start analysing data collected	Research area										xxx	xxx
Trip back to Germany	Research area											xxx

Annex III.   Reliability analysis

1.   Attitude

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.911	.923	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
health danger	5.33	33.817	.611	.463	.907
waste reduction	5.80	35.635	.603	.447	.907
usage pleasant	5.52	33.021	.833	.847	.892
usage enjoyable	5.43	32.585	.861	.869	.889
usage wise	5.67	32.898	.843	.904	.891
usage necessary	5.67	32.628	.865	.903	.889
chemical comparison	5.41	34.311	.577	.459	.909
customer approval	4.91	33.464	.451	.328	.928
over all attitude	5.55	33.263	.819	.698	.893

2.   Subjective norm

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.615	.636	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
community support	5.73	3.370	.596	.627	.404
important persons support	5.79	3.075	.635	.644	.353
religious teaching support	7.03	4.716	.206	.071	.654
likelihood that other farmers are using it in their farms	6.29	3.434	.248	.076	.704

3.   Perceived behavioural control

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.455	.455	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
assessing ability to transport fertilizer to the farm	1.71	.962	.295	.087	.[a]
level of confidence to apply	2.03	.999	.295	.087	.[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Annex IV.   Spearman's rho correlations between each of the independent variables
and the dependent variable

1.   Attitude and behavioural intentions

Correlations

			attitude	Behavioural intentions
Spearman's rho	Attitude	Correlation Coefficient	1.000	.801[**]
		Sig. (2-tailed)	.	.000
		N	149	149
	Behavioural intentions	Correlation Coefficient	.801[**]	1.000
		Sig. (2-tailed)	.000	.
		N	149	150

**. Correlation is significant at the 0.01 level (2-tailed).

2. Subjective norm and behavioural intentions

Correlations

			subjective norm	Behavioural intentions
Spearman's rho	subjective norm	Correlation Coefficient	1.000	.433[**]
		Sig. (2-tailed)	.	.000
		N	146	146
	Behavioural intentions	Correlation Coefficient	.433[**]	1.000
		Sig. (2-tailed)	.000	.
		N	146	150

**. Correlation is significant at the 0.01 level (2-tailed).

3. Perceived behavioural control and behavioural intentions

Correlations

			behavioural intentions	perceived behavioural control
Spearman's rho	behavioural intentions	Correlation Coefficient	1.000	.521[**]
		Sig. (2-tailed)	.	.000
		N	150	150
	perceived behavioural control	Correlation Coefficient	.521[**]	1.000
		Sig. (2-tailed)	.000	.
		N	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Annex V.   Regression with the three independents variables as predictors

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.855[a]	.730	.724	.426

a. Predictors: (Constant), attitude, subjective norm,
Perceived behavioural control

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	69.114	3	23.038	127.218	.000[a]
	Residual	25.534	141	.181		
	Total	94.648	144			

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural
control

b. Dependent Variable: Behavioural intentions

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.808	.088		9.217	.000
	Perceived behavioural control	.137	.043	.169	3.165	.002
	subjective norm	.029	.021	.066	1.342	.182
	attitude	.091	.007	.714	12.496	.000

a. Dependent Variable: Behavioural intentions

Annex VI.   Regression with the addition of other demographic variables

1.   With the addition of age

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.855[a]	.730	.724	.426	.730	127.218	3	141	.000
2	.858[b]	.735	.720	.429	.005	.536	5	136	.749

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, age dummy 3, age dummy 5, age dummy 1, age dummy 2, age dummy 4

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	69.114	3	23.038	127.218	.000[a]
	Residual	25.534	141	.181		
	Total	94.648	144			
2	Regression	69.608	8	8.701	47.256	.000[b]
	Residual	25.041	136	.184		
	Total	94.648	144			

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, age dummy 3, age dummy 5, age dummy 1, age dummy 2, age dummy 4

c. Dependent Variable: Behavioural intentions

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	.808	.088		9.217	.000		
Perceived behavioural control	.137	.043	.169	3.165	.002	.669	1.496
subjective norm	.029	.021	.066	1.342	.182	.802	1.246
attitude	.091	.007	.714	12.496	.000	.585	1.708
2 (Constant)	.837	.177		4.736	.000		
Perceived behavioural control	.138	.044	.170	3.097	.002	.649	1.540
subjective norm	.029	.022	.066	1.323	.188	.781	1.280
attitude	.091	.007	.712	12.194	.000	.571	1.752
age dummy 1	.079	.177	.036	.445	.657	.292	3.421
age dummy 2	-.093	.174	-.045	-.530	.597	.268	3.736
age dummy 3	-.054	.168	-.030	-.321	.749	.220	4.552
age dummy 4	-.052	.174	-.026	-.300	.765	.256	3.903
age dummy 5	.035	.196	.012	.177	.859	.406	2.465

a. Dependent Variable: Behavioural intentions

Excluded Variables^b

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	age dummy 1	.059ª	1.358	.177	.114	.995	1.005	.584
	age dummy 2	-.040ª	-.897	.371	-.076	.985	1.015	.581
	age dummy 3	-.020ª	-.463	.644	-.039	.997	1.003	.585
	age dummy 4	-.015ª	-.348	.728	-.029	.984	1.017	.585
	age dummy 5	.025ª	.560	.576	.047	.974	1.026	.583

a. Predictors in the Model: (Constant), attitude, subjective norm, Perceived behavioural control

b. Dependent Variable: Behavioural intentions

2. With the addition of level of education

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.855ª	.730	.724	.426	.730	127.218	3	141	.000
2	.857ᵇ	.734	.720	.429	.004	.493	4	137	.741

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, educational level dummy 4, educational level dummy 2, educational level dummy 1, educational level dummy3

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	69.114	3	23.038	127.218	.000[a]
	Residual	25.534	141	.181		
	Total	94.648	144			
2	Regression	69.476	7	9.925	54.019	.000[b]
	Residual	25.172	137	.184		
	Total	94.648	144			

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, educational level dummy 4, educational level dummy 2, educational level dummy 1, educational level dummy3

c. Dependent Variable: Behavioural intentions

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
1	educational level dummy 1	-.019[a]	-.416	.678	-.035	.949	1.054	.570
	educational level dummy 2	.044[a]	.993	.323	.084	.994	1.006	.585
	educational level dummy 3	-.023[a]	-.513	.609	-.043	.988	1.012	.579
	educational level dummy 4	.035[a]	.803	.424	.068	.994	1.006	.585

a. Predictors in the Model: (Constant), attitude, subjective norm, Perceived behavioural control

d. Dependent Variable: Behavioural intentions

3. With the addition of sex

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.855[a]	.730	.724	.426	.730	127.218	3	141	.000
2	.856[b]	.732	.725	.425	.002	1.162	1	140	.283

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, sex dummy

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	69.114	3	23.038	127.218	.000[a]
	Residual	25.534	141	.181		
	Total	94.648	144			
2	Regression	69.325	4	17.331	95.814	.000[b]
	Residual	25.324	140	.181		
	Total	94.648	144			

a. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control

b. Predictors: (Constant), attitude, subjective norm, Perceived behavioural control, sex dummy

c. Dependent Variable: Behavioural intentions

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.808	.088		9.217	.000		
	Perceived behavioural control	.137	.043	.169	3.165	.002	.669	1.496
	subjective norm	.029	.021	.066	1.342	.182	.802	1.246
	attitude	.091	.007	.714	12.496	.000	.585	1.708
2	(Constant)	.845	.094		8.976	.000		
	Perceived behavioural control	.135	.043	.166	3.104	.002	.667	1.500
	subjective norm	.029	.021	.065	1.339	.183	.802	1.246
	attitude	.092	.007	.718	12.542	.000	.584	1.713
	sex dummy	-.077	.071	-.047	-1.078	.283	.996	1.004

a. Dependent Variable: Behavioural intentions

Excluded Variables^b

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	sex dummy	-.047^a	-1.078	.283	-.091	.996	1.004	.584

a. Predictors in the Model: (Constant), attitude, subjective norm, Perceived behavioural control

b. Dependent Variable: Behavioural intentions