IMPACT OF ESTATE VEGETABLE PRODUCTION ON THE WELFARE OF EMPLOYEES

A report presented to the Department of Agricultural Economics and Extension Education of the University of Zambia

BY

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ABBREVIATIONS

CSO	Central Statistics Office
ZMK	Zambian kwacha
SPSS	Statistical package for social sciences
PRSP	Poverty Reduction Strategic Paper
USAID	United States of America International Development
VIF	Variance Inflation Factor
EU	European Union
ZEGA	Zambia Export Growers Association
EurepPGAP	European Union for Retailers and Producers Good Agricultural Practices
MoFNP	Ministry of Finance and National Planning
OLS	Ordinary least squares
PS	Propensity score
UK	United Kingdom

ABSTRACT

IMPACT OF ESTATE VEGETABLE PRODUCTION ON THE WELFARE OF EMPLOYEES

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The horticultural industry is an important sector in the economic welfare of many Zambian families. In this study, the impact of estate vegetable production on the welfare of employees in Borassus was undertaken. The general objective of the study was to determine the impact of large-scale export vegetable production on the welfare of the employees. The specific objectives were to determine the socio-economic status_of people employed on large-scale export vegetable production firms and to determine the extent to which large-scale export vegetable production has contributed to the welfare of the people employed by these firms.

The study used survey data collected using structured questionnaires fro a sample of 105 households which included 41 horticultural and 64 non-horticultural worker households. The sample was drawn using stratified random sampling and simple random sampling was used from the two strata. SPSS was used to come up with descriptive statistics and two econometric models were used. The probit model was used to determine the factors that influence participation in the industry. An income model was also used to determine the influence of participation as well other factors on income and in turn the impact of participation on welfare.

The major factors that were found to influence participation included age (p-value =0.007) and education level (p-value =0.003) of the household head and the number of children (p-value =0.089) in the household. From the income model results, participation (p-value =0.000) in the industry was found to be very significant on the incomes earned. The impact of the vegetable estate production on welfare was found to be positive.

The study recommended that future projects be carried out across the country with a larger sample size so as to get more insight on the impact of the industry on welfare.

CHAPTER 1
INTRODUCTION

1.1 Introduction and Background

The agricultural sector contributes 18 percent to real GDP and 39 percent of earnings from non-traditional exports (PRSP, 2006).The sector mainly consists of smallholder farmers who make up about 52 percent of the country's farmers (Chipokolo, 2006).They also contribute 80 percent of the nation's food (Chuma, 2004).Despite their substantial contribution to national food supply and GDP, small holder farmers constitute a third of the national hungry and poor (CSO, 2004). Unsatisfactory access to the markets and market information are some of the factors attributed to low welfare levels among smallholder farmers (Chiwele, 2004). Poor or non-existent infrastructure, including roads, power and telecommunication facilities, are also serious constraints. Small holder farmers also suffer from inadequate finance and capital due to lack of access to credit facilities (USAID, 2005). There are also natural reasons such as poor harvest and animal losses resulting from droughts and animal diseases (Chiwele, 2004).

Recent growth in the horticultural sector could have a positive impact on the welfare of the rural poor as the sector provides employment and is a source of foreign exchange. Zambia has been exporting fresh horticultural produce (flowers and vegetables) since the early 1980s. Since that time the industry has expanded rapidly and this has led to increased volumes for export, alternative foreign exchange earnings and increased numbers of companies joining the industry (ZEGA, 2002). Exports of vegetables and cut flowers rose from $6 million in 1994 to over $33 million in 2001 when the sector employed about 10,000 people but has since declined. This decline was mainly due to the biggest horticultural export company, Agriflora, getting into financial difficulties in 2004 and subsequently going into administration. Some of its assets were sold to other exporters, but a significant amount of its production was lost and has not been recovered. Ninety-five percent (95%) of floriculture and 90% of horticulture production is exported to the European Union. Small amounts are exported to South Africa, Australia and the

Far East. Currently there are three main exporters of horticultural produce, York Farm, Borassus and Chalimbana (Sergeant and Sewadeh, 2006).

There are various arrangements through which smallholder farmers get involved with large-scale export vegetable production. First, there is contract farming where the firm provides technical assistance and the necessary inputs to local smallholder farmers and the farmers in turn provide labour. Specific contract terms and conditions vary from scheme to scheme. It normally covers the services provided by the companies, pricing of inputs, interest rates on advances and the price paid for produce supplied to the company. Secondly, there is large-scale estate production on large farms where the local people are employed (Dolan and Humphrey, 2000). There has been an increasing demand for high quality and safety standards in the high-income markets and this has led to the creation of new trade barriers for developing country exports (Augier, et al., 2005). In addition to creation of trade barriers, increasing standards has led to the marginalization of the small businesses and poor households in developing countries, as they are unable to compete favorably with large companies and the developed countries. The increased demand for high quality and food standards has induced structural changes in the supply chain including a shift from small holder contract-based farming to large-scale estate production (Dolan and Humphrey, 2000).

1.2 Statement of the Problem

A number of studies have been done in other countries that have suggested export horticulture as a way of reducing poverty. McCulloch and Ota carried out a study on export horticulture and poverty in Kenya. The authors looked at the contribution of export horticulture to poverty reduction through its provision of employment vis-à-vis estate production and outgrower schemes. They found that households involved in export horticulture were better off than non-horticultural households. Maertens and Swinnen did a research on trade, standards and poverty in Senegal and found that despite the increasing food standards in the European Union, horticultural exports had grown and these exports had a positive effect on poor households' income. They also contend that

tightening food standards had actually induced structural changes in the supply chain. Supply chain restructuring has altered the mechanism through which the local households benefit increasingly through labour markets instead of through product markets. However, there is a more fundamental problem with literature on high standards trade and poverty. None of these studies has measured fully the developmental impact of export horticulture through labour and the influence it has on the rural labour market. These studies tend to ignore the labour market effects of employment on the large estates which can be very important.

1.3 Objectives of the Study

1.3.1 General Objective:

- To determine the impact of large-scale export vegetable production on the welfare of the employees.

1.3.2 Specific Objectives:

- To determine the socio-economic status of people employed on large-scale export vegetable production firms.
- To determine the extent to which large-scale export vegetable production has contributed to the welfare of the people employed by these firms.

1.4 Rationale of the Project

This study is aimed at determining the impact of large-scale export vegetable production on the welfare of the employees. The findings of the study will enable policy-makers in both the private sector and the government to design programs that would enhance the welfare of employees, thus contribute to poverty reduction.

1.5 Organization of the Thesis

This thesis opens up with chapter one which highlights the background information about the subject. It covers the problem statement, rationale of the study and objectives.

Chapter three covers literature review in which the trends of the horticultural industry in Zambia are discussed. It also covers poverty and agriculture, past studies and the importance of the industry. Chapter two also looks at the conceptual framework. Chapter three looks at the methodology used for the study. It encompasses description of the data collection procedure, sampling design, survey process, types of data collected and data analysis. Chapter four covers findings and interpretation of the findings of the study. Chapter five looks at the conclusion and recommendations based on the findings.

CHAPTER 2
LITERARURE REVIEW

2.1 Introduction

This chapter looked at extent of poverty in Zambia, the horticultural industry in Zambia, past studies on export horticulture, importance or potential benefits of export horticulture, the major constraints and opportunities facing the sector and conceptual framework.

2.2 Poverty and Agriculture in Zambia

Zambia's per capita income was $302 in 2000 but the share of its population living below the poverty line increased from 70 percent in 1991 to 75 percent in recent years (MOFNP, 2002). Severe health problems including malaria and HIV/AIDS have contributed to this situation. Data from 1997/8 cite 921,061 households in rural areas of the country, with female-headed households making up 23 percent of this number (CSO, 2000). It is widely known that female-headed households suffer a considerably higher likelihood of living in poverty.

World Bank data (2002) for 2000 estimates that 56 percent of the population lives in rural areas. With an estimated 97.4 percent of the rural people engaged in agriculture (CSO, 2000) and 83 percent in poverty, this equates to 45 percent of the total population-approximately 4.6million people dependent on agriculture.

Within the labor force of 3.4 million, 85 percent are employed in agriculture, 6 percent in industry and 9 percent in services. Agriculture serves as the main source of income for the rural people, especially women, who constitute a higher proportion of the rural people and the agricultural labor force. With unemployment at 50 percent (2000 estimates, World fact book, 2002), agriculture is often the only potential source of livelihood or income within the informal sector.

2.3 The Evolution of the Horticultural Industry in Zambia

This industry developed first in Africa in Kenya. From almost nothing in the late 1960's, export of fresh flowers had reached 29,000 tonnes by 1995, fresh vegetables had reached 28,500 tonnes and the export of fresh fruit had reached 14,000 tonnes, worth over US$100m per annum. The industry spread, but on a smaller scale, to other countries in the region - Tanzania, Uganda and Zambia - all of which were economically less stable and less well-disposed towards the private sector during the 1970's and 1980's.

The current growth of horticultural exports from Zambia started in the early to mid-1980s when incentives such as foreign exchange retention and subsidized air freight encouraged a number of farms to start exporting. These exports were predominantly targeted at the United Kingdom and other North European markets and were focused around supplying mangetout in the European summer. Other crops such as fine beans and baby corns have been added to increase the product range. The industry gradually expanded and became much more professional and is regarded as significant competition to Kenya, which is the biggest exporter of air-freighted horticultural produce to Europe (ZEGA, 2002). In 2004 Zambia exported 3, 995 tonnes (value US$29.8m) of fresh flowers and 6,238 tonnes (value US$18.1m) of fresh vegetables, with more than 16,500 people employed by the sector (Geoff Tyler)

There are a number of reasons why Zambia built up a reasonably successful horticultural and floricultural industry. There was a group of farmers who wanted to diversify into exports and who had the commercial and technical skills to produce high-value crops, the country had the climate to grow certain horticultural crops in the Zambian winter and roses in its summer – which gave sufficient all-year-round produce to attract cargo aircraft throughout the year. The growers established the Zambia Export Growers Association (ZEGA), which helped organize the cargo aircraft, manage the airport cold store and represent the industry (ZEGA, 2002). Finally both the horticultural and floricultural industry received constructive support from the donors. Currently, there are three main exporters, York Farm, Chalimbana Fresh Produce, and Borassus, who produce

their crops on large commercial farms that have been EurepGAP certified (Sergeant and Sewadeh, 2006).

2.4 Export Horticulture

2.4.1 Past Studies

A number of scholars have conducted research on the impact of export horticulture on the welfare of the employees. According to a study conducted in Kenya by Neil McCulloch and Masako Ota on export horticulture and poverty in Kenya, a household survey was undertaken to compare the incomes of households involved in export horticulture with those which are not. It was discovered that households involved in export horticulture were better off than those which are not, particularly in rural areas. Thus, it was concluded that enabling more households to participate in the sector could reduce poverty substantially in both rural and urban areas. Maertens and Swinnen, 2006, conducted a research on trade, standards and poverty: evindence from Senegal. This study quantified income and poverty effects of high standards trade and to integrate labor market effects by using company and household survey data from the vegetable export chain in Senegal. It was discovered firstly that horticultural exports from Senegal to the EU had grown sharply despite strongly increasing food standards in the EU. Secondly, it was found out that these exports had strong positive effects on poor households' income. These exports reduced regional poverty by around 12 percent and reduced extreme poverty by half. Thirdly, tightening food standards induced structural changes in the supply chain including a shift from smallholder contract-based farming to large-scale integrated estate production. However, these changes mainly altered the mechanism through which poor households benefit. Moreover, the impact on poverty reduction was stronger as the poorest benefit relatively more from working on large-scale farms than from contract farming.

2.4.2 Importance or Potential Benefits of Export Horticulture

Export horticulture has been promoted due to its significant benefits to employees and the wider economy. It provides employment to both those people employed on large-scale estate production and the local farmers that produce on behalf of exporters under contract, it is through this provision of employment to the locals that export horticulture contributes to poverty reduction (McCulloch and Ota, 2006). In Zambia, the sector employs workers in pack houses i.e. both unskilled and semi-skilled labor engaged in weighing, grading, cutting and packing vegetables. Most of these people are employed on casual basis or short-term contracts with the work being highly seasonal. Given this outline we expect export horticulture to reduce poverty in urban areas by providing employment to unskilled people who are mainly women who might have few alternatives (ZEGA, 2002).

2.5 Major Constraints and Opportunities

The horticultural export industry is faced with the following constraints and opportunities:

2.5.1 Revaluation

The revaluation of the Kwacha has hit the horticultural industry hard. The sector estimates that about 25 percent of its costs are Kwacha-based (because of the high labor costs). The rest of their other costs are predominantly dollar-based and will therefore eventually decline (Sergeant and Sewadeh, 2006).

2.5.2 Freight Issues

A key success factor in the establishment of the horticultural sector has been the industry working to negotiate competitive freight rates. The main cost of running a cargo aircraft is the cost of aviation fuel which is about 50 percent of the direct costs associated with cargo aircraft thus making the cost in Zambia much more expensive than other competing countries in the region, by 40 to 50 percent (ZEGA, 2002).

The horticultural industry is very concerned about its future. The industry is in part coping with the revaluation by trucking the produce to South Africa to reduce costs in an effort to remain competitive. However, even these savings will not be sufficient to negate the losses caused by the revaluation. The exporters have two different strategies for coping. The first is to significantly reduce output and concentrate on the higher-value and higher-margin lines, which will lead to considerable decrease in the number of people employed. The other strategy is to increase output and try to reduce costs, i.e. improve efficiency to increase margins. The longer-term issue with the first solution is that reducing output will effectively mean that some market share will be lost, possibly forever. The problem with the second solution is that it is very high risk.

2.5.3 Main Safety and Phytosanitary Issues

The bulk of Zambia's horticulture exports are to the EU, with the UK and Holland being the main destination. Horticulture exports to the EU are subject to a wide array of official regulations and private codes of conduct that are usually required by retailers. Under EU regulations, plants, including fresh fruits and vegetables, entering the EU must be accompanied by a phytosanitary certificate issued by the competent authority in the country of origin confirming that the shipment meets the EU requirements (e.g. free of pests). Moreover, competent authorities issuing phytosanitary certificates are required to adhere to a set of operational rules and are generally subject to inspections and oversight by the European authorities (Sergeant and Sewadeh, 2006).

The EU rules also set some requirements on the packaging. For example, the packaging of the consignment or the means of transport used in shipping horticultural produce must be closed or sealed to ensure that no infestation or infection in transit can take place. EU regulations also set levels for the maximum levels of pesticide residues in fresh fruits and vegetables (ZEGA, 2002).

2.6 Conceptual Framework

An impact is defined as the expected value of the difference between the level of the outcome variable attained by participating households and that which they would have attained had they not participated in the program (Wooldridge, 2000; Ravallion, 2001). That is,

$$E(Y) = E(Y_{1i} - Y_{0i} \mid w_i = 1) \tag{1}$$

When the i^{th} individual participates in wage estate employment, their level of income is Y_{1i} and if they do not their income is Y_{0i}.

This is the conditional mean impact, conditioning on participating in the program-called treatment effect or the average effect on the treated (Wooldridge, 2002). However, if there is a difference in mean income between participants and non-participants in the absence of the program a bias will arise and this bias is given by:

$$b = E(Y_{0i} / w_i = 1) - E(Y_{0i} / w_i = 0) \tag{2}$$

The above bias could be corrected if $E(Y_{0i} / w_i = 1)$ was known, but not even a sample estimate can be obtained. Thus, what the level of income would have been had the participants not participated can not be observed. However, had the program been assigned randomly, the participants and non-participants could have the same expected income in the absence of the program. In this case, the expected income of non-participants will then correctly reveal the counterfactual, that is, the income that would have been observed for the participants had they not had access to the program.

Since randomization is not possible for such a program due to ethical, cost and other pragmatic reasons. In the case of vegetable estate employment treatment households were deliberately chosen on the basis their being employees on these firms. Under such a quasi-experimental design, statistical controls must be used to address the differences between the treatment and control groups (Barker, 2000). Under some form of exogeneity (Imbens, 2003), most quasi-experimental impact studies estimate the conditional average treatment effect on the treated as

$$E(Y) = E(Y_{1i} - Y_{0i} / X, w_i = 1) \quad (3)$$

Where X is a vector of covariates. The assumption implied by the above equation is that conditioning on carefully selected covariates, X, renders the household's treatment effect status independent of potential outcomes, such that the unobserved $E(Y_{0i} / w_i = 1)$ can be represented by the observed $E(Y_{0i} / w_i = 0)$. This makes it possible to attribute any systematic differences in the outcome variables between treated and control units with the same values of the covariates to the program in question.

A more appealing version of the above equation involves replacing X with the estimated conditional probability of participation, also referred to as the propensity score. Rubin and Rossenbaum (1983) showed that conditioning on the propensity score is equivalent to conditioning on X, where the former is defined as:

$$P(X) = P(w = 1 / X) \quad (4)$$

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

The chapter covers the methods of data collection and analysis, and gives the details of the study design, description of the study area, the sampling procedure, and the sampling unit.

3.2 Description of the Study Area

The research study was conducted in a farm area called Borassus. Borassus is horticultural farm located about 25 km from Lusaka town. The sampling unit was an individual farm worker household and an individual non-farm worker household.

3.3 Study Population and Sampling Procedure

To determine the impact of large scale export vegetable production on the welfare of employees, data was collected from 105 households in Borassus, a farm area about 25 km from Lusaka. The purpose of the survey was to obtain detailed data on the characteristics of these households and their household income. In order to estimate the determinants of income and of participation in the export horticulture industry and to examine the effect of the industry on poverty alleviation, the households of 41 farm workers were randomly selected from those working at Borassus. In order to compare incomes and levels of poverty between households which participate and those who do not participate in export horticulture, 64 non-farm worker houscholds were also interviewed. A listing of the non-horticultural worker households was done. A random sample of 64 households was then selected. These non-farm worker houscholds were selected from the neighbours of the farm worker households in the area where the latter households are concentrated. It is assumed that the characteristics of households living in the same compound or vicinity will be more likely to be similar than those living in much richer areas. The sampling

procedure used was stratified random sampling. This method of sampling facilitated unbiased research, as the entities were more representative.

3.4 Data Collection

Both primary and secondary data were collected in this study. Primary data were collected by means of structured questionnaires because the literacy levels of farm-workers and non-farm workers varies, therefore, structured questionnaires helped obtain accurate information. Secondary data were collected from various institutions such as the Ministry of Agriculture and Cooperatives and Central Statistic Office, and from other relevant publications.

3.5 Data Analysis

The computer software statistical package for social sciences (SPSS) was used to generate descriptive statistics. Simple econometric models were used to obtain quantitative estimates of the parameters in STATA.

A probit model of programme participation as a function of all the variables in the data that are likely to determine participation was estimated. This is given as shown below:

$$w_i = \beta_0 + \beta_i X_i + \varepsilon_i \qquad (1)$$

Predicted values of the probability of participation from the probit regression were created. These are the propensity scores (PS). A propensity score is the conditional probability of participation given observed covariates (X) and was estimated by a probit model.

In order to determine the impact of wage estate employment on the welfare of employees, Income level was regressed on a set of control variables as well as whether the individual participates in wage employment using the PS. The PS was used as opposed to the participation variable in order to avoid the problem of endogeneity. This is given by the model below:

$$In(Y_i) = \theta + \alpha PS_i + \beta_1 X_i + \varepsilon_i \qquad (2)$$

Where

Y_i is the income level of the i^{th} individual.

X_i stands for control variables such as education, size and demographic composition of the household, age, assets, etc.

W_i is a dummy equal to 1 if participant and equal to 0 otherwise.

PS is the propensity score.

ε_i is the error term that includes other determinants of income and measurement errors.

θ, α, β_i are parameters.

These covariates are generally believed to determine rural incomes and also affect households' decision to participate. These measures of physical and human capital increase the income generating capacity of a household.

In the final model, we further include interaction terms between the participation variables and the demeaned PS:

$$In(Y) = \theta + \alpha w_i + \phi PS_i + \gamma w_i (PS_i - \mu_{ps}) + \varepsilon_i \qquad (3)$$

Where

μ_{ps} is the average PS.

$(PS_i - \mu_{ps})$ is the demeaned PS.

3.6 Data Collection Limitations

The study was limited by the budget constraints and this forced the researcher to conduct the study in one location Borassus rather than the whole district, which could have been more ideal. Time was another limiting factor. To carry out an effective research required a lot of time for preparations and implementation but was not adequate. Due to the nature of the sample, there was need for translations from English to some local languages which required some time.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the study findings. It begins with a presentation and discussion of the demographic characteristics. This chapter presents and discusses the study findings. It begins with a presentation and discussion of the demographic characteristics. The factors affecting participation are discussed under results of the probit model. The impact of participation on welfare is discussed under the income model results.

4.2 Descriptive statistics.

Table 1: Demographic characteristics

Participation	Total	Horticultural	Non-horticultural	Significance
Age	40.15	37.46	41.87	**
Sex	0.77	0.80	0.75	
Education level	8.88	9.29	8.62	
Farm labour	0.69	0.76	0.65	
Male adults	1.78	1.58	1.78	
Female adults	1.78	1.63	1.87	
Children	2.26	2.29	2.25	
Elderly males	0.07	0.07	0.06	
Elderly females	0.08	0.10	0.06	
Land size	0.7104762	0.74	0.69	*
Ownership of field	0.7047619	0.83	0.63	
Value of livestock asset	267428.6	493414.6	122656.3	

Source: Own Field Survey (2008)

The variables in the above table were tested for their effect on participation in the industry. It was found that only age of the household head and size of land owned by the household were significant at 5% and 10% respectively. This shows that the sample was balanced, that is, the two groups were identical in most respects with the exception of participation.

The majority of the sampled households were male headed (77.1%) while (22.9) were females headed. Therefore, there were more male headed households than female headed households. Eighty percent of the horticultural households were male headed compared to 75% of the non-horticultural households that were male headed. This shows that there were more female headed households among the non-horticultural households as compared to their counterparts.

In terms of age, horticultural household heads are likely to be younger than non-horticultural household heads. The average age of horticultural heads is 37 years while that of non-horticultural heads is 41 years. The same applies to education level of head. Horticultural household heads are likely to be more educated compared to non-horticultural heads. As shown in the table, horticultural households on average attained the ninth grade compared to non-horticultural heads who attained the eighth grade on average. This provides an indication that horticultural households are better off at least than non-horticultural households. Younger persons who are more educated are more likely to work harder and hold higher positions and thus earn more income as compared to older less educated ones.

In terms of household size, the two groups are not so different. Horticultural households had on average one male adult, one female adult and two children, this was also the case with non-horticultural households. The proportion of elderly persons in both groups was insignificant-this is seen from the averages for both groups which are less than one. It is highly likely that both groups had very few elderly persons in their households.

In terms of provision of farm labour, more horticultural household members (75.6%) provided farm labour as compared to non-horticultural household members (62%). In the same vein, the former own more land on average of 0.74hectares as compared to the former who own an average of 0.69hectares. This observation could be explained by the fact that most horticultural firms give their employees a portion of land on which they cultivate.

The table also shows that horticultural workers own more than twice the livestock assets owned by the non-horticultural workers. Horticultural workers on average own assets worth K493, 414.60 while non-horticultural workers own assets worth only K122, 656.30. These statistics provide an indication that horticultural workers are better off than non-horticultural workers.

4.3 Housing Conditions and Access to Facilities

Table 2: Housing Conditions

	Horticultural (%)	Non-horticultural (%)	Total (%)
Pit latrines	0.703125	0.703125	0.7047619
Piped water	0.878049	0.15625	0.2857143
Electricity	0.9512195	0.4375	0.6380952
Value of consumable assets	1300829	530437.5	831257.1
Value of productive assets.	156097.6	0	60952.38

Source: Own Survey Data (2008).

The table shows that 70% (28) of horticultural households have access to pit latrines compared to 70% (44) of non-horticultural households with access to the same. In addition to this, 87% and 15% of horticultural and non-horticultural households respectively have access to piped water on their plot. There are also 95% and 43% of horticultural and non-horticultural households respectively that are electrified.

Horticultural households own consumable assets worth K1, 300,829 on average compared to non-horticultural workers who own the same assets valued on average at K530, 437.5. Further more, horticultural workers productive assets worth at K156097.6 while their counterparts own none of these assets. This provides a further indication that horticultural workers are better off than non-horticultural households.

4.4 Model of participation in the industry.

Table 3: Results of the First Stage Probit

Variable	Variable description	Parameter estimates
Intercept		5.732*** (1.798)
Hhage	Age of head years	-0.1080*** (0.031)
Hhsex	Sex of head,1=male	-0.2129(0.5311)
Max edu	Education level of head in years	-0.518***(0.1434)
Mstatus	Marital status,1=married	0.1249(0.4907)
Land	Landholding size (ha)	-0.1198(0.2137)
M16to55	Males 16-55years	-0.11608(0.230)
F16to55	Females 16-55years	-0.1209(0.1818)
C0to15	Children 0-15years	-0.499***(0.184)
M56to70	Elderly males 56 years plus	1.34(0.832)
F56to70	Elderly females 56 years plus	0.974(0.657)
Assets	Value of durable assets in million ZK	5.598***(0.912)
Number of observations		105
Prob>chi		***
Pseudo R-squared		0.632

Source: Own Survey Data (2008)

Dependent variable: participation dummy

Significance: * = 10 percent; **= 5 percent; *** = 1 percent

In brackets are robust standard errors.

The dependent variable was a dummy for participation. The model was tested for multicollinearity using the variance inflation factor, omitted variables and heteroskedacity. Multicollinearity and omitted variables were not evident. The Cook-Weisberg test for heteroskedasicity rejected the null hypothesis of constant variance, so robust standard errors were used using the white's correction method.

The above table shows the factors affecting participation in the horticultural industry. These determinants were estimated using the probit model. From the results, it can be seen that participation in the program is significantly dependent on the age and education level of the head, number of children in the household and value of durable assets owned by the household. These variables are statistically significant at 95% confidence level. However, participation is not significantly dependent on sex and marital status of the head, size of land owned by the household, number of working adults and also the number of the elderly in the household.

The effects of demographic characteristics show that household size in terms of male and female adults and the number of children is negatively associated with participation. That is, the presence of more of these groups of people in the household decreases the probability of households being involved in the industry. Having a lot of children (aged 0-15) has a negative effect on participation, particularly if the children are younger. The large and negative and strongly significant impact of a higher proportion of children in the household suggests that caring for a large number of children poses more constraints upon the household's ability to obtain income. However, the presence of more elderly males and elderly females is positively associated with participation, although the older the household head, the less likely the household is to be involved. Also, education of the head is not positively associated with participation. Households with better educated heads are less likely to participate. Sex is also not positively associated with participation. Male headed households are less likely to participate.

The coefficient for land size shows that households with more land are less likely to participate in the industry. Those with large hectorage of land are more likely to do

farming as a business rather than working on a horticultural farm. However, this is not in agreement with the descriptive statistics for land size. This is because, as mentioned earlier, most horticultural firms give their workers a portion of land on which to cultivate. The value of assets owned is positively associated and statistically significant. Households with more durable assets are more likely to participate.

The coefficient for marital status is positive though insignificant. This is explained by the fact that if the household heads is married, resources such as labour and other material resources may increase enabling the household to have higher income. Whilst the head is at work, in the case where the spouse does not work, the spouse could be engaged in other productive activities.

The above model confirms many of the determinants of participation in the industry suggested by the descriptive statistics.

4.5 Model for Income Determination.

The descriptive statistics above provide an initial indication that participation in the industry appears to improve the income of the household. However, such descriptive statistics do not take into account other possible differences in the characteristics of the households participating in the industry and those that do not and it may be these differences that are giving rise disparities in income rather than their participation. To account for this, a model for income determination was constructed as shown below:

$$ln(Y) = \theta + \beta_1 PS + \beta_2 Age + \beta_3 Educ + \beta_4 Mstatus + \beta_5 Assets + \beta_6 Sex + \beta_7 Mads + \beta_8 Fads + \beta_9 Melds + \beta_{10} Feld + \beta_{11} Child + \beta_{12} Land + \varepsilon_i$$

Where PS is the propensity score; Age is the age of the household age; Educ is the education level of the household head; Sex is a dummy variable for the sex of the household head; Mads is the proportion of male adults in the household; Fads is the proportion of male adults in the household; Child is the proportion of children in the household; Meld is the proportion of elderly males in the household; Feld is the proportion of elderly females in the household; Land is the size of land owned, Assets is the value of assets owned by the household and ε_i is the error term.

The results of the above model are as shown in table below:

Table 4: Econometric Results for the Model of Income Determination.

Variable	Variable description	Parameter estimates	
		IV	OLS
Intercept	Constant	13.266***(0.344)	13.59***(0.262)
dwork	Participation dummy, 1=farm worker	1.20***(0.149)	0.766***(0.091)
Hhage	Age of head in years	0.009*(0.005)	0.006(0.044)
Hhsex	Sex of head, 1=male	-0.042(0.165)	-0.056(0.151)
Max edu	Education level of head (years)	0.061**(0.021)	0.055***(0.080)
Mstatus	Marital status, 1=married	-0.038(0.196)	0.010(0.047)
Land	Landholding size (ha)	0.038(0.061)	0.017(0.041)
M16to55	Male members 16-55 years	0.083*(0.043)	0.049(0.042)
F16to55	Female members 16-55 years	0.0518(0.0443)	0.028(0.042)
C0to15	Children 0-15 years	0.0628**(0.0294)	0.037*(0.028)
M56plus	Elderly male members over 56 years	0.0073(0.1743)	0.001(0.171)
F56plus	Elderly female members over 56 years	-0.125(0.183)	-0.063(0.161)
Assets	Value of assets (million ZMK)	-0.0553(0.0498)	0.067(0.664)
Number of observations		105	105
F (12, 92)		26.13***	17.65***
R-squared		0.4975	0.586
Adjusted R-squared		0.4320	0.409

Source: Own Survey Data, 2008

Dependent variable: log income

Significance: * = 10 percent; **– 5 percent; *** = 1 percent

In brackets are robust standard errors.

The dependent variable was log income. The model was significant at 1%. It was tested for multicollinearity using the variance inflation factor, omitted variables and heteroskedacity. Multicollinearity and omitted variables were not evident. The Cook-Weisberg test for heteroskedasicity rejected the null hypothesis of constant variance, so robust standard errors were used using the white's correction method.
The IV estimator was used to regress income on the PS as well as the other covariates. In addition to the latter estimator, OLS estimator was used to regress income on the participation variable (W_i) as well as the other covariates.

The aim of this model is to examine whether the differences in income between the two groups disappear when other differences are taken into account. However, this is not the case as presented in the table. From the IV estimator, the table shows that horticultural worker households are better off than non-horticultural worker households as indicated by the coefficient on the participation variable. This confirms that the large disparities in income presented above are not merely a consequence of the different characteristics of the households in each group. The participation effect is very large, household participation in the industry raises income by 120%.

This model also provides useful insights into the determinants of income. In addition to participation, age and education level of the household head, and the proportion of adult males and children in the household are statistically significant. This implies that in addition to participation, income is significantly dependent on the age and education level of the head, the proportion of male adults and children in the household. However, income is not significantly dependent on sex and marital status of the head, provision of farm labour, proportion of female adults, elderly females and elderly males in the household, size of land, and the value of assets.

Income is also positively associated with age and education level of the head, male adults, female adults, children and elderly males in the household and size of land owned by household. Households with older heads and with heads having a higher level of education will have higher incomes. With each additional year of education completed,

income will increase by 6.1%. The role of education has been extensively discussed in literature. Education enhances the allocative ability of decision makers by enabling them to think critically and use information sources efficiently. Households with more educated heads should be aware of more sources of information and are efficient in evaluating and interpreting information about innovations than those with less education. Similarly, an additional year in the age of the head will increase income by 0.9%. Conversely, male headed households are less likely to participate as shown by the negative coefficient on sex. Male headed households' participation in the industry reduces income by 4.2%. Further more, an increase in the size of land owned by the household by one hectare increases income by 3.8%.

In terms of household size, increasing the number of male adults, female adults, children and elderly males in the household will increase income by 8.3%, 5.2%, 6.3%, and 0.7% respectively. Conversely, increasing the number of elderly females by one will reduce income by 12.5%. Sex and marital status of head, proportion of elderly females, and value of assets owned are negatively associated with higher incomes. An increase in the value of assets by one million kwacha reduces income by 5.5%. This implies that the more assets a household owns, the lower its income.

Under the OLS estimator, only age and education of the household head are significant in addition to participation.

Table 5: Model with Interaction terms between Participation and the demeaned Propensity Scores.

Variable	Parameter estimates
Intercept	14.495***(0.062)
Participation dummy, 1=farm worker	0.468***(0.145)
Propensity score	0.754***(0.256)
Interaction between participation and Propensity Score	-0.374(0.350)
Number of observations	105
F(3,101)	34.42***
R-squared	0.506
Adj R-squared	0.491

Dependent variable: log income

Source: Own Survey Data , 2008.

The PS shows that one works, the participation variable shows that one either participates or not and interaction term shows the interaction between participation and the demeaned PS. Demeaned PS are the differences between the PS and the mean of the PS. Income is significantly dependent on participation and the PS. Participation in the industry increases income by 46.8% while the coefficient for PS shows that working increases income by 75.4%.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion and recommendations of the study based on the findings and interpretations of the study.

5.2 Conclusions.

This study was designed to study the impact of horticultural industry on the welfare of employees using data from a survey of rural households. Poverty is widespread in Zambia with more than half the population estimated as living below the poverty datum line. Thus, the encouragement of land and labour intensive industries such as the export horticulture industry has been seen by many as a means of creating employment and reducing poverty.

This paper makes the link between export horticulture and welfare clear by comparing the incomes of horticultural and non-horticultural household incomes. It was found in general that horticultural households are better off than non-horticultural households. The probit model was used to determine factors that influence participation. Participation was found to be significantly dependent on the age and education level of the head, number of children in the household and value of durable assets owned by the household.

The model of income determination was used to analyze the impact of participation in the industry on welfare. Participation in the industry was found to be very significant, thus had a positive impact on income and in turn on welfare. Horticultural households were found to be better off than non-horticultural household. It was found that participation in the industry raised income by 120%. Thus, vegetable estate production has a positive impact on welfare of employees. In addition to participation, income was also found to be significantly dependent on age and education level of the household head, and the

proportion of adult males and children in the household. Thus, there are clear differences in welfare systems between horticultural and non-horticultural households.

5.3 Recommendations

A suggestion to the government is that it should pay more attention to export horticulture through the labour market as opposed to contract farming. This comes out of the realization that export horticulture also benefits employees through estate production. Thus, I strongly recommend that government put more emphasis on estate production during policy formulation.

A suggestion to future studies is to carry out surveys across the country with a much larger sample size in order to increase variations within the sample hence, capture more variables of importance. When results of such a survey are analyzed with available literature on the characteristics of the vegetable estate production there will be a greater understanding of the impact of the industry on welfare.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Questionnaire serial number |___|___|___|

Household identification

1.1 District code **dist** |___| District name: _____

1.2 Block code **const** |___| Block name: _____

1.3 Camp code **ward** |___| Camp name: _____

1.4 Village name:_____ Chiefdom: _____

_____

1.5 Household code **hh** |___|___|___| Name of household head **head**:_____

1.6 a) Year household head was born **yob** |___|___|___|___|

b) Sex of household head **sex** |___|

(1=Male; 2=Female)

1.7 Is the household head the main respondent? **rown** |___

1 = Yes→ *Go to question 2.1*
2 = No

1.8 a) Name of main respondent **resp**_____

b) Relationship to head **rship** |___|___|

2.0 Demographics

Can you please give me the names of the individuals who have been members of this household the past 5 years? ***Start with the current household head., then the current members, and then those that have since left***		What is ...'s sex?	When was ... born?		What is/was ...'s marital status?	What is/was the highest level of education attained by ...	What is/was ...'s relationship to the head?	Was ... a member of this household in 2005?	Is ... a member of this household now?	If **DM08=2**, why not?	Did ... provide farm labour the past 12 months?	Has ... been chronically ill the past 3 months?
Member code	Member name	1=Male 2=Female	Month ***Codes below***	Year (e.g 1967)	1=Single/under-age 2=Monogamously married 3=Polygamously married 4=Divorced/ separated 5=Widowed	***See code below***	***See code below***	1=Yes 2=No	1=Yes→**DM 10** 2=No→**DM 09, then Next member**	1=Left to look for job 2=Married away 3=Left due to illness 4=Left for other reasons 5=Deceased	1=Yes 2=No	1=Yes 2=No
MID		**DM01**	**DM02**	**DM03**	**DM04**	**DM05**	**DM06**	**DM07**	**DM08**	**DM09**	**DM10**	**DM11**
1												
2												
3												
4												
5												
6												

Month born codes (DM02)

1=Jan
2=Feb
3=Mar
4=April
5=May
6=June
7=July
8=August
9=September
10=October
11=November
12=December

Level of education codes (DM05):

0=None
1=Sub A; Grade 1
1=Sub B; Grade 1
2=Std 1; Grade 2
3=Std 2; Grade 3
4=Std 3; Grade 4
5=Std 4; Grade 5
6=Std 5; Grade 6
7=Std 6; Grade 7
8=Form 1; Grade 8
9=Form 2; Grade 9
10=Form 3;
11=Form 4; Grade 11
12=Form 5; Grade 12
13=Form 6
14=College Student
15=Tertiary Certificate
16=Bachelors degree

Relationship to head codes (DM06):

1=Head
2=Spouse
3=Own child
4=Step child
5= Parent
6= Brother/Sister
7= Nephew/Niece
8= Son/daughter-in-law
9= Grandchild
10=Other relation (Specify)
11=Unrelated
55=Farm manager

3. Assets: Physical/capital assets

Asset type		Does the household have ...? 1=Yes 2=No→ *Go to next asset*	Which year did the household get the newest....? *(e.g. 1982)*	How many ...s does the household own?	Approx. what is the current value of all the ...s? (ZMK)	How many ... did this household have in 2005 *Enter '0' if none*	How much money did the household earn from sale of ... in the past 12 months (ZMK)? *Enter '0' if none*
asset	**Name/description**	**AS01**	**AS02**	**AS03**	**AS04**	**AS05**	**AS06**
1	Tractor						
2	Truck/pick up						
3	Tractor trailer						
4	Other tractor-drawn implements						
5	Ox cart						
6	Other ox-drawn implements						
7	Chairs						
8	Television set						
9	Radio						
10	Sewing machine						
11	Mobile phone						
12	Bicycle						
13	Treadle pumps						
14	Bank account						
15	Cash at hand						
16	Bed						
17	Mattress						
18	Table						
19	Cooker						
20	Pressing iron						
21	Carpet						
22	Computer						
23	Wardrobe						
24	Display unit						
25	Other assets (specify, e.g. those in the house)						

3.2Ownership of Livestock assets

Fill in the following table about the household's ownership of livestock assets.

set type	How many ....s does the household own currently?→ *Go to next*	What is the current value of ....? (ZMK)	How many ...s did the household earn in 2005?	What w as the value of ....? (ZMK)	How many ... has the household sold in the last 12 months? *Enter '0' if none*	How much money did the household earn from sale of ... in the past 12 months (ZMK)? *Enter '0' if none*	How many ...has the household consumed in the past 12months? *Enter '0' if none*	How many...has the household purchased in the past 12 months? *Enter '0' if none*	How many the hous giver away the p mont *Ente none*
	OL01	**OL02**	**OL03**	**OL04**	**OL05**	**OL06**	**OL07**	**OL08**	**OL0**
Cattle									
• Calves									
• Steers									
• Heifers									
• Cows									
• bulls									
Donkeys									
Sheep									
Goats									
Poultry									
• chickens									
• guinea fowls									
• ducks									
• geese/turkeys									
• pigeons									
• rabbits									
Pigs									
Other livestock									

4.0 Housing condition

4.1 What is the roofing material for your house made of?

1. Iron/metal 3. Asbestos 5. Grass/straw hh01
2. Tiles 4.Corrugated iron sheets 6. Other, specify.....

4.2What is the wall material for your house made of?

1. Burnt bricks 4. Pole/bamboo 7. Grass/straw hh02
2. Concrete blocks 5. Pole and dagga 8. Iron sheets
3. Mud bricks 6. Mud (mudhindo) 9. Hard board

4.3What is the door material for the house made of? hh03

1. Standard door frame and door
2. Traditional

4.4What is the floor material for the house made of? hh04

1. Cement 3. Mud 5. Other, specify.....
2. Concrete 4. Bear earth

4.5Does your house have a pit latrine as the main facility toilet? hh05

1. Yes [ ]
2. No [ ]

4.6 If yes, what type of pit latrine is it? hh06

1. Ordinary pit latrine [ ]
2. Ventilated Improved Pit latrine [ ]

4.7 Does your house have piped water into the home or plot? hh07

1. Yes [ ]
2. No [ ]

4.8 Is there electricity in your house?

1. Yes
2. No hh08

5.0 Infrastructure

5.1 How far is the main (surfaced) road from your homestead? hh09 ☐

5.2 How far is the nearest storage shed from your homestead? hh09 ☐

5.3 How far is the nearest primary school from your homestead? hh10 ☐

5.4 How far is the nearest secondary school from your homestead? hh11 ☐

5.5 How far is town from your homestead? hh12 ☐

5.6 How long does it take to get to the main road by motorized vehicle in the

a) Dry season (minutes)? hh10 ☐☐☐

b) Rainy season (minutes) hh11 ☐☐☐

5.7 For how many months in a year is the nearest main road accessible? hh12 ☐

6.0 Off-farm income

Fill in the following table on income earned by household members since January 2004.Be sure to include casual/salaried employment, businesses, and remittances.

*List **MIDs*** and names of all members who have contributed *off-farm income-during the past 12 months*		List three most important off-farm income generating activities (IGA) used by … during the past 5 years (***employment, businesses, remittances)*** ***See codes below***	How much income did … earn from this IGA during the past 12 months (ZMK)? *Enter '0' if none*	How much income did … earn from this IGA between January 2005 and June 2008 (ZMK)? *Enter '0' if none*	Which year did … start this IGA
MID	**Name**	**IN01**	**IN02**	**IN03**	**IN04**

Off-farm income sources (IN01)

CASUAL/SALARIED EMPLOYMENT

1=on smallholder farm
2=on a horticultural commercial farm
3=on a non-horticultural commercial farm.
4=in a warehouse
5=in a mine
6=other industrial work
7=teacher
8=other civil servant
9=clerk
10=shop attendant
11=non agricultural piece work

BUSINESSES

21=agricultural trading
22=livestock trading
23=retailer/shop owner
24=hawker/vendor/marketer
25=firewood/charcoal production
26=carpentry
27=builder
28=local brewing
29=butchery(all meats including game, cooked or uncooked)
30=Agric services (e.g. ploughing, planting, spraying)
31=milling
32=tailor
33=bicycle repair
34=weaving
35=blacksmithing
36=traditional doctor
37=Fishing and selling fish
38=Mining of precious stones
39=Other (specify)
40=Sale of household goods
41=Remittances

7.0 HOUSEHOLD EXPENDITURE

I would like to find out how much money this household spends on different items as well as food is consumed.

a) School expenses

	How much was spent on the following during the 1st,2nd and 3rd terms	Give amount in kwacha, if none enter zero		
		1st term	2nd term	3rd term
1.1	School fees including exam fess			
1.2	School uniforms including shoes,socks,ties etc			
1.3	Contributions to PTA/school			
1.4	Private tuition			
1.5	Books and stationery			
1.6	Other school expenses			

b) Household Expenses

Item		How much was spent on …during the last 1 mth?	How much was spent on …during the last 1 year?
1.1	Medical services e.g. medicines, schemes etc.		
1.2	Clothing and foot wear		
1.3	Housing expenses e.g. rent, water, electricity, candles, paraffin, etc		
1.4	Cash remittances		
1.5	Public transport e.g. to and from school, work and other transport expenses		
1.6	Personal transport e.g. petrol/ diesel, vehicle repairs and maintenance, motorbike/bicycle repairs		
1.7	Personal services e.g. toiletries, cosmetics, entertainment, etc		
1.8	Food -mealie-meal -maize grain -grinding expenses		

c) Other household expenses

How much was spent on/consumed from own produce or received on the following food items during the past 1 mth and 1 year?	Cash purchases (amount in kwacha)		Own produced consumed (amount in kwacha and unit)		Received (gifts, food for work, relief food, etc) (amount in kwacha and u	
	1 mth	1 year	1 mth	1 year	1 mth	1 year
Cereals e.g. maize, rice, sorghum, millet						
Tubers e.g. cassava,s/potatoes, Irish potatoes						
Meat e.g. cow, goat, sheep, pig, game meat						
Chicken and other poultry, e.g. g/fowl, turkey, ducks, etc						
Vegetables e.g. beans, tomatoes, onions, etc						
Fruits						
Eggs						
Milk (fresh and powdered						
Bread /rolls/buns / fritters						
Sugar						
Salt						
Cooking oil						
Cigarettes/tobacco						
Alcoholic beverages						
Non-alcoholic beverages						
Tea/coffee/cocoa/milo, etc						

AGRICULTURE ACTIVITIES 2007/8 SEASON.

Area of the plot					*Ask only if FD03<24*									
					Seed					**Fertilizer**				
Qty (No. of units)	Unit 1=Ha 2=Acre 3=Lima	What main crop or use did you put this field to in 2007/08? *Codes below*	Main tillage method used *Codes below*	Was tillage done before rainy season? 1=Yes 2=No	Variety used 1=Local 2=Improved (specify)	Main reason for using this variety *Code below*	Qty of seed planted (kg)	Main source and mode of access *Codes below*	Price (K/kg) *Enter '99' if not appl.*	Qty of basal dress fert applied (kg) *Enter '0' if none*	Qty of top dress fert applied (kg) *Enter '0' if none*	Main source and mode of access *Codes below*	Avg price of fert (K/kg)	Did the hh apply manure in this field? 1=Yes 2=No
FD01	**FD02**	**FD03**	**FD04**	**FD05**	**FD06**	**FD07**	**FD08**	**FD09**	**FD10**	**FD11**	**FD12**	**FD13**	**FD14**	**FD15**