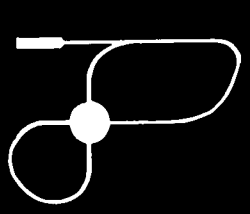
TRRL Supplementary Report 791



TRANSPORT and ROAD RESEARCH LABORATORY

DEPARTMENT of the ENVIRONMENT DEPARTMENT of TRANSPORT

Accessibility and agricultural development in the Ashanti region of Ghana

by

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Department of the Environment
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SUPPLEMENTARY REPORT 791

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ACCESSIBILITY AND AGRICULTURAL DEVELOPMENT IN THE ASHANTI REGION OF GHANA

ABSTRACT

The report examines the relationship between agricultural development and accessibility in the Ashanti Region of Ghana. A wide variety of factors are identified that can influence agricultural development in the Region and some of the problems of its measurement are highlighted.

Using a cross sectional framework of analysis, data was collected from 33 villages (all but two with vehicle access) in the Ashanti Region of Ghana located between 8 and 102 km from the Regional Capital, Kumasi. By comparing a number of development parameters and the transport costs of moving farm produce between each village and Kumasi (and also between each village and its respective district centre) the link between accessibility and agricultural development was investigated.

Within the range of accessibility considered little evidence was found to indicate that market agriculture was promoted directly by accessibility. However, loan finance was easier to obtain the nearer the farmer lived to Kumasi.

Overall there is evidence to suggest that the most accessible villages tended to concentrate more on non agricultural activities (such as rural industry and the provision of services, including marketing) while the less accessible villages concentrated rather more on agriculture. The study supports the view that where road investment can induce only a small change in transport costs then little impact on agricultural development may be expected.

1. INTRODUCTION

The planning of rural road investment in developing countries can be improved by an understanding of how that investment may influence agricultural development, and subsequently rural development in general. The Building and Road Research Institute in Kumasi (Ghana) and the Overseas Unit of the TRRL (UK) have collaborated in a study of the impact of feeder road investment in the Ashanti Region of Ghana; the work was undertaken for the Ghana Highway Authority and partially funded by the World Bank[1].

Road projects are most usually justified on the basis of the forecast savings in transport costs gained by road users. Whilst this is widely accepted as adequate for road investment which caters for inter-urban traffic it is believed that transport cost savings can only partially reflect the development benefits which may arise from improved communications to rural areas.

Although a number of case studies have been carried out in different developing countries on the relationship between development and road investment it has not been possible to generalise satisfactorily from their results[2]. In consequence the ability to predict the effect of road investment on rural development is limited. It is against this background that the study was conceived.

It was recognised that the best chance of obtaining usable relationships between accessibility and development in the time scale available would be to collect field data from villages located at varying distances from a major urban centre. In fact sample data was collected from 33 villages in Ashanti Region located between 8 and 102 km from the Regional capital, Kumasi.

This report analyses the influence of accessibility on rural development by comparing a number of parameters of rural development with the transport costs of moving farm produce between each village and Kumasi, or between a village and its respective district centre. The main emphasis of this report is on the relationship between accessibility and agricultural production. The relationships between accessibility, transport costs and marketing are considered elsewhere[3].

2. AGRICULTURE IN ASHANTI REGION: THE CONTEXT

2.1 *Introduction*

This section discusses the principal factors that determine and influence agricultural change in the survey area. Its purpose is to provide a context for evaluating the influence of accessibility on development in relation to the particular conditions in Ashanti Region at the present time. The survey itself is described in Section 3. Many of the major institutions and most of the basic communications infrastructure of the Region have been in place since the 1950s. During the past twenty years the pattern of rural economic activity has tended to be rather static with some decline in the important cocoa sector. A description of the data collection and on analysis of results are included in later chapters.

Although there is some measure of agreement as to what constitutes agricultural development the issue is not unambiguous. Most would accept that high yields, the use of new inputs like fertilizer and improved seeds, and the growth of market agriculture are reasonable indicators of agricultural development. Nevertheless,there is much less agreement between agriculturalists as to what practices should be advocated by the extension service, whether land should be switched between growing a crop for export and growing a different crop for the local market or what farming practices are best for the farmer and the country. These disagreements stem largely from four problem areas. These are domestic labour input, farmer risks, the long term availability of modern inputs and relative domestic and international prices.

Taking each in turn.

i) Labour input
Farmers are interested in getting the best return from their own labour. They will be naturally reluctant to undertake new agricultural practices which, even though yields may be increased, will nevertheless demand a disproportionate increase in their own labour effort.

ii) Farmer risks
Farmers will tend to be reluctant to expose themselves to greater risks of substantial crop losses even though 'on average' they may be better off by adopting a given change in farming practice.

iii) The availability of modern inputs
Many new farming practices are based on modern inputs. If the farmer is to adopt a new practice then he must have confidence that the modern inputs will be available when he wants them in the longer term.

iv) Relative domestic and international prices.
It is possible for relative international and domestic prices to move so far out of line that a farmer would be financially better off by growing a food crop on his land rather than an export crop like cocoa even though it would be better from the point of view of the national economy if the reverse was the case.

These issues are considered in greater detail below.

2.2 *An increase in production and sales with no change in farming technology*

Perhaps the most straightforward way for farmers to respond to better accessibility is by simply employing more inputs to increase production. The relative use of inputs will remain basically the same and the method of cultivation will be unchanged. If the better accessibility lowers transport tariffs to move produce to market then the farmer will gain an effective rise in his farm gate prices. The rise in farm gate prices will then make it profitable to employ more labour to increase the land under cultivation and so a rise in production will result.

Bateman[4] has calculated a short term price elasticity of 0.22 for cocoa production in Ashanti and Brong Ahafo Regions of Ghana, which means that a one per cent rise in cocoa prices (in real terms) would induce a 0.22 per cent rise in production. However, using Nigerian data Stern[5] has calculated a supply price elasticity of 1.29 for cocoa acreage which does suggest a much larger response. A study by Oury[6] of the supply elasticities for a number of crops in different developing countries gives a range of between 0 and 1.5. The range of supply elasticities is to be expected in view of the differences in resource endowment, population density and cultural background found in areas covered by the studies.

If the costs of agricultural labour and other inputs also decline as a result of the lower transport costs then the farmer will find it profitable to employ even more inputs to expand production. Better accessibility will not necessarily have these effects for an uncompetitive transport industry may prevent tariff reductions from taking place. Likewise labour costs may actually rise as a result of improved accessibility by enabling agricultural labour to seek better paid employment elsewhere.

Carnemark, Biderman and Bovet[7] have developed a model to cover a range of situations (eg. increased domestic consumption, increase in cropped area, crop substitution and regional deficits) that can be used to predict possible changes which might occur with reduced transport costs.

Using their framework of analysis the most critical variables that are needed in order to predict a rise in production following a road investment can be identified as follows:-

i) the absolute change in the farmers' farm gate price

ii) the farmers' price elasticity of supply

iii) the change in labour prices

iv) the change in other (non labour) input prices.

Obviously the greater the increase in farm gate prices, the greater the reduction in input prices and the more elastic the farming supply curve the bigger the increase in production that will occur following road investment.

2.3 *Technical change, labour input and population density*

The current pattern of food farming that is practised in the forest zone of Ashanti Region is based on shifting cultivation. This is a pattern of farming whereby a piece of land is cropped for up to three years and then left to bush fallow for up to ten years to regenerate the fertility of the soil. When the area is to be cleared again the land is cleared by fire, the large trees and tree stumps are left in the ground and cultivation is carried out with a hand hoe.

Food farming in the forest zone of Ashanti Region is, therefore, characterised by virtually no modern inputs and low total yields. Boserup[8] has suggested that the reason shifting cultivation persists, along with other agricultural practises giving low total yields is because, with existing population density these practises meet farmers' needs at least effort. She puts forward the view that technical change in agriculture has taken place principally in response to population pressure, usually over a time span of centuries. In traditional societies, for a given level of population pressure, a farming technology is adopted which will meet basic needs with the minimum of labour input.

It is argued that with each change in traditional farming technology, moving from forest fallow through the stages of bush fallow, short fallow, annual cropping to multicropping, there are diminishing returns from extra labour input. To obtain increased yields from a given land area it is necessary not only to change farming technology but also to increase disproportionately the labour input. However, with high population density the scarcity of land is such that intensive methods of cultivation are forced upon the local population even if this does mean a much increased daily input of labour per person.

From this point of view it is easy to understand some of the reluctance of farmers to respond to advice to adopt new farming practices which may increase farming yields per acre. From the farmers' point of view it may well be an inefficient use of their labour to attempt to adopt intensive methods of farming to increase yields from a small farmed area when less effort applied over a larger farmed area may produce more output.

Boserup recognises that with the use of modern labour-saving technical inputs (such as tractors, irrigation pumps, insecticides etc.) the marginal productivity of labour may well increase with more intensive methods of cultivation, rather than decrease as with the more traditional changes in agricultural technology. Thus, farmers may be willing to adopt more intensive methods of cultivation provided they can obtain the new inputs cheaply enough. However, the adoption of many aspects of new technology will not necessarily represent the most efficient use of resources. It is now widely recognised that farmers are aware of a range of agricultural practises but they will not adopt more intensive methods of cultivation unless population pressure or widely available cheap modern inputs encourages them to do so.

Although Boserup's thesis may be useful in making broad comparisons between different farming areas and different countries it may nevertheless be criticised for paying insufficient attention to differences within farming areas relating to factors such as land tenure, climate, terrain, soil fertility, available water or the presence of urban areas. All of these factors are likely to lead to local relative specialisation, trade and the adoption of different farming methods. In practice, of course, a variety of farming technology will be adopted within any farming area.

2.4 *Mixed cropping*

Throughout the forest area of Ashanti Region food is usually grown in crop mixtures. Most often three or four dominant crops are grown together with a number of other crops thinly scattered throughout the plot. Typically, maize, cassava and cocoyam are grown as dominant crops interspersed with beans, tomatoes, plantains and yams, but many combinations of these plants are found. In its early stages, cocoa is often grown mixed with food crops, particularly plantain and cocoyam.

There are different opinions on the wisdom of mixed cropping[9,10]. The evidence on achievable yields per unit area and on returns to labour input is conflicting. On balance it seems that mixed cropping has advantages for small scale farming where no modern inputs are used but "pure stands" are more suitable when hired labour, mechanical cultivation and chemical inputs are employed. The advantages claimed for mixed cropping (compared

with growing crops in single stands) are that it lessens the chance of complete crop failure, it lessens damage from pests and diseases and it is more effective in conserving soil fertility because different crops have different soil nutrient demands. Mixed cropping can also be labour saving to the small sale farmer because it is possible to undertake several operations such as weeding, harvesting and planting during the same visit to the farm.

The disadvantages of mixed cropping become apparent when modern inputs are introduced and a more commercial approach to farming is adopted, as mixed cropping does not lend itself to mechanical cultivation. The use of selective chemical inputs (such as fertilizer, weedicides and pesticides) to meet the requirements of particular crops is impractical with mixed crops. To make the best use of chemical inputs the plant densities of the target crop have to be usually at such a high level that interplanting with other crops is not practical. With more commercial agriculture the economics of using hired labour for harvesting at one time are such that again pure cropping is demanded.

To summarise it would seem that shifting cultivation and mixed cropping are an efficient and rational method of producing food by family labour on small farms. The deficiencies of farming by this method only really become apparent when modern inputs and hired labour are introduced on a large scale.

2.5 *Cocoa*

2.5.1 *The development of the cocoa industry.* The most important development in Ghanaian agriculture was the establishment and growth of the cocoa industry. Cocoa plays a key role in the economy accounting for 60 per cent of Ghana's export earnings and a third of the Government's revenues[11]. Cocoa growing is concentrated in the South of the country and is particularly important in Ashanti Region. Forty per cent of Ghana's cocoa acreage is planted here and approximately three quarters of the cultivated land in the Region is under cocoa[12].

Cocoa growing was developed in Ghana during the 1880s – 1890s by indigenous entrepreneurs who responded to the high prices offered by international traders at the coast. Cocoa was first established in the Akwapim area before the widespread use of motor vehicles. Cocoa growing rapidly spread west and northwest as farmers bought up lands with profits made from existing cocoa farms. Before the end of the 19th century cocoa was established in Eastern Ashanti. Its spread through the Region was helped by the expansion of the road and rail network in the 1920's and 1930's.

In the light of the modern approach to agricultural development which calls for extensive extra-industry support it is interesting to note that cocoa growing developed without government supplies of inputs, capital, extension advice, seeds, or insecticides. The main ingredients for success were a profitable market, suitable land, local entrepreneurship, capital, labour and a source of cocoa seedlings[13].

2.5.2 *Cocoa Marketing.* The Ghana Cocoa Marketing Board has become responsible for the local purchasing of cocoa from the farmer through buying posts operating from all but the very smallest villages in the cocoa growing areas of the country. In contrast to other crops the farmer is paid a fixed price at the buying post for his produce. The onward movement of the cocoa is then the responsibility of the Board and the adverse effects of inaccessibility on the smallholder cocoa farmer are minimised.

2.5.3 *Pests and diseases.* Cocoa production in Ghana has suffered considerably from two main causes, swollen shoot disease and capsids. Swollen shoot disease is a virus infection that is spread from diseased to healthy trees by crawling and wind blown mealybug insects. The disease has decimated cocoa production in large parts of Eastern Region in the past, its only cure is to cut out the diseased plant and completely replant.

The family of insects known as capsids are a major pest on cocoa trees throughout the whole of West Africa. When feeding the capsid injects its poisonous saliva into the plant which eventually causes the tree to weaken and die out. Control is successfully achieved by regular spraying with insecticide.

2.5.4 *New varieties.* High yielding hybrid varieties of cocoa have been introduced which will yield much earlier in the life of tree than the original strain of cocoa such as the Amelonado variety. The hybrid varieties have greater resistance to pests and diseases and have somewhat higher yields. No fertiliser is recommended with any variety of cocoa. The widespread adoption of new cocoa varieties would obviously require an increase in transport capacity however the net effect on average traffic flows would be negligible.

2.5.5 *Cocoa production and prices.* Cocoa production in Ghana reached an all time high in 1964/65 when 557,000 tons were produced. Since then production has gradually declined as old and dying trees have not been replanted on a sufficient scale. This is thought to be related to relatively poor producer prices and the unwillingness of young people to take up cocoa farming.

Bateman[4] has calculated that the price offered to producers declined in real terms from the early 1950's onwards to reach a level in 1968/69 of only 35 per cent of the 1954 price. During the 1970's the real price decline continued but at a slower rate to reach a level of 33 per cent of the 1954 price in 1975/76. Between 1976 and 1980 the timing and rise of cocoa prices offered to farmers has tended to lag behind the price increases of other food crops.

2.6 *Relative prices and the choice of crops*

Expected price is a key factor in the farmer's decision to grow a certain crop. Given production costs the absolute price is needed to determine whether a crop is worth growing at all. The relative prices of other crops (and their relative costs of production) are needed to find which is the best crop to grow.

A problem emerges at the national level when relative domestic prices do not adequately reflect relative international prices. In this case a farmer may be encouraged through price incentives to grow one crop which has less value to the country than another crop. Such a situation appears to have arisen in Ghana in recent years in terms of the relative domestic prices offered for food and cocoa.

In much of Ashanti Region (as elsewhere in Southern Ghana) land can be used to grow food or cocoa. In many places farmers have dug up their cocoa farms (or failed to replace old and poor yielding trees) to grow food in response to the relatively higher food prices, whilst from the country's point of view it can be argued that it would have been better to concentrate on growing more cocoa and less food. If necessary extra food could be imported with the extra export earnings from the cocoa.

In August 1978 the cocoa price paid to farmers was approximately 1.5 times the price they would get for selling the same weight of maize at the Kumasi Central Market. At the same time on the international markets in Europe, cocoa was worth 18.5 times more than maize[14].

Although the ratios are not strictly comparable because of the relative valuation of production costs*, the costs of transport and the fact that cocoa prices can fluctuate enormously (in January 1982 the international

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* In order to define precisely the optimum it is necessary to also consider the domestic and international valuation of the production costs. However, in the forest areas of Ashanti labour is the major critical resource to grow both crops and so one may expect that the ratio of the domestic valuation of resources to grow maize relative to cocoa will be little different to the ratio of an international valuation of the same resources.

market price of cocoa was 9 times the price of maize)[15], the figures are sufficiently far apart to suggest that cocoa was relatively so under-valued during the study period that farming decisions on cocoa were likely to be far from optimal from Ghana's national economic point of view.

2.7 *The role of extension services*

Ashanti Region is supplied with a wide diversity of extension services and purchasing organisations. Operating in different areas these institutions will supply advice, credit and a variety of modern inputs to the farmer.

2.7.1 *Cocoa Production Division.* The prime role of the Cocoa Production Division is to check the spread of pest and diseases that affect cocoa. Each year a proportion of cocoa in the Region is sprayed with insecticide by the Division to prevent damage by capsid attack. The whole of the cocoa growing area of Ghana is covered by the Division.

Officers of Cocoa Production Division keep detailed records of any outbreaks of swollen shoot disease. Once the disease is identified the cocoa plant is cut out and replanted. The Cocoa Production Division keeps cocoa nurseries and will assist farmers with the planting of new stock.

2.7.2 *Ashanti Cocoa Project.* The Ashanti Cocoa Project is an independent externally financed organisation, operating principally in the south of the Region. It has 12 district offices, nearly 30 senior officers and over 400 field staff. Officers of the Project have the task of setting up new cocoa farms in their area of operation. They first identify farmers interested in growing cocoa; they will then measure the farmer's land and organise a 'loan application' for the farmer. Once this has been agreed the organisation will clear the land and plant cocoa seedlings and for the initial 'non bearing' years they will also plant food crops in between the cocoa for the farmer.

In many ways the Ashanti Cocoa Project has almost taken over the traditional entrepreneurial role from the farmer for establishing the cocoa farm. A complaint often made by field staff of the Project is that farmers take little interest themselves in the Cocoa farm and they appear willing to let the Project staff do everything to establish the farm. Perhaps this is not surprising.

2.7.3 *Department of Agriculture, Crops Extension Division.* This Division covers the whole of Ashanti Region, operating from 6 district centres with 16 supervising staff and nearly 100 field staff. The Crops Extension Officer provides general agricultural expertise to the farmer; he will supply new seeds and fertiliser and also help in obtaining official loans.

In Ashanti Region it appears that particular attention has been given by Extension Officers to maize growing. This is probably because of the development of new high yielding seeds which are responsive to the application of fertiliser. Maize thus provides a good opportunity for extension work. Maize storage chemicals are also distributed by the Extension Officer.

The Extension Officer helps farmers apply for loans by helping them to organise into a loan co-operative. The loan is granted by one of the commercial Banks to the co-operative in the first instance and it is then distributed amongst the co-operatives' members.

2.7.4 *Other extension organisations.* There are a number of other extension organisations operating throughout the Region. The Animal Husbandry Department distributes chicken feed and other animal foodstuffs. There is a small Veterinary Department that pays particular attention to monitoring the health of sheep and goats in the Region, these being the only large animals kept in the Region in substantial numbers.

The Grains and Legumes Board encourages farmers to grow improved seeds. In Ashanti Region its efforts are concentrated in the Offinso area. It lays out demonstration plots, arranges loans and supplies seeds and fertiliser to farmers. Like the Crops Extension Division the Board gives particular attention to maize growing. It also has the role of principal supplier of improved seeds in Ghana.

The Cotton Development Board and the Bast Fibre Development Board promote and purchase cotton and bast fibre in the Region, both concentrationg their activities in the North of the Region.

2.8 *The availability of finance and modern inputs*

Finance and modern inputs are critical to agricultural development in Ashanti Region. As a result of economic difficulties there has been a shortage of many of the key inputs to agriculture. Both fertiliser and poultry feed have been particularly scarce. Insecticide for spraying cocoa has been more widely available although local shortages coupled with some organisational problems in the Cocoa Production Division have caused some farmers to report difficulties in getting their fields sprayed.

One problem with the adoption of new farming technology is that it is often necessary to apply different inputs (eg. new seeds, fertilisers, top dressing) and carry out a number of different procedures in sequence if it is to prove worthwhile. Atsu[16] has shown that if only half the recommended practice for growing new maize is carried out then the new measures taken will prove to be an expensive failure. It is for this reason that farmers do need long term confidence that suppliers of modern inputs will be available before they will take to adopting many of the new recommended practices.

Finance is commonly claimed by farmers to be the critical factor preventing them from expanding their farms. If the farmer is to undertake large scale changes in his farming then a loan will almost inevitably be required. Small scale farmers find it difficult to gain the confidence of the official lending agencies and they are often forced to go to unofficial sources for loans at very high rates of interest.

2.9 *Marketing*

The relationships between transport, accessibility and marketing are discussed in another report[3]. The developmental role of marketing is outlined here in order to complete the description of the principal factors that influence agricultural development in Ashanti Region.

Marketing provides a stimulus to grow more than is required for domestic use, it encourages specialisation in food crop production and it provides the farmer with the cash resources to purchase extra inputs which will in turn help to increase production.

There are risks in specialisation and if the marketing system is costly and inefficient then farmers will be reluctant to specialise and produce for the market. An inefficient marketing system can be caused by a poor spread of price information, collusion between market operators, small volumes of produce for sale and a relatively expensive, monopolistic and uncertain transport system.

Virtually all small scale farmers in Ashanti Region grow food for domestic consumption and a large majority will also sell some of their food although cash is also obtained from selling cocoa, personal remittances and paid employment. Whilst cocoa is sold at the Cocoa Marketing Board buying posts the majority of food is first purchased by travelling wholesalers at the farmer's house and at local markets. A smaller proportion is sold on the farm or taken by the farmer direct to the larger central markets in the Region.

3. THE STRUCTURE AND ORGANISATION OF THE STUDY

3.1 *The analysis framework*

There are two distinct ways of identifying the impact of road investment on rural development. One method is to survey an area before and after a road investment is undertaken so that an historical comparison may be made. A second method (the cross sectional approach) is to survey a range of areas with varying degrees of accessibility at the same time. A careful interpretation of the observed differences and of 'control' data is required with both approaches.

The cross sectional approach was adopted in this study.

3.2 *Accessibility in Ashanti Region*

3.2.1 *The dominant position of Kumasi.* Kumasi is the Regional capital of Ashanti Region. It is the second largest town in Ghana with a population of 400,000 which is over ten times larger than any other town in the Region. The road network of the whole Region and most of the central southern part of Ghana radiates from Kumasi. It is an important rail terminus and has an airport. Besides being a major market town Kumasi also has some national headquarters and all of the regional headquarters of the extension services operating throughout the Region. Even at the fringes of the Region the pull of other major towns from outside the Region is comparatively small due to their size and distance from the border of the Region.

In view of its central importance the travel costs from anywhere in the Region to Kumasi can be used as a convenient measure of accessibility.

3.2.2 *The measures of accessibility used in the analysis.* Two principal measures of accessibility were used in the analysis and the relationships quoted in this report relate largely to these measures. These are:-

(i) The cost to the farmer of moving one standard headload of produce from village to Kumasi.

(ii) The cost of moving one standard headload of produce from village to the nearest District Centre.

Both 'costs' were based on charges farmers would have to pay to take their individual loads; wholesale transport charges were not readily available for the survey villages.

The costs of moving a headload of produce from farm (rather than from village) to Kumasi and District Centre were also used as alternative measures of accessibility to check the viability of the conclusions. In practice the four measures of accessibility were found to correspond fairly closely with each other.

3.3 *Development parameters*

In order to assess the impact of roads it is necessary to measure rural development, however, no single unambiguous indicator was found suitable for the study. The combination of mixed cropping, subsistence farming, a lack of farming records, high rates of inflation and a wide variation in reported district centre commodity prices all contributed to making it impractical to value total farm output.

The view was taken that a whole range of social and economic parameters should be surveyed so that a comprehensive view of the effects of better accessibility may be assessed. To this end it was recognised that data should be collected on farm inputs, outputs and on farming technology as well as data on social characteristics and available social facilities.

3.4 *Control factors*

At the outset it was recognised that rural development would also be influenced by a range of factors which were largely unconnected with road access. It was felt that terrain, population density, soil characteristics, rainfall and crop diseases were key factors to be taken into account in the analysis.

3.4.1 *Terrain.* It was felt extremes of terrain should be avoided when locating the survey villages so mountainous areas were deliberately excluded from the survey. Moderately rolling countryside is common throughout most of Ashanti Region.

3.4.2 *Population density.* Boserup has suggested that population density may have a major influence on farming technology (see Section 2.3). In order to accommodate the analysis to this factor, district and village populations were collected from official sources and household population was collected in the survey. District population density, village population and household numbers per farm area were used as alternative measures of population density.

3.4.3 *Soil characteristics.* The soils in Ashanti Region can be grouped into two broad types, forest soils and savanna soils. The forest soils are less suitable for mechanical cultivation than the savanna soils of the north, however, they are suited to cocoa growing. Soil fertility will vary even with an area of uniform soil type. It was for this reason that soil samples were collected for analysis from each survey village.

3.4.4 *Rainfall.* Annual average rainfall varies across the Region from a high of 1800 mm near Bekwai in the south of the Region to 1400 mm in the north east of the Region. Although rainfall in the north tends to be more seasonally concentrated than in the south, there is a great deal of local variability in the rainfall patterns month by month caused by the passage of isolated thunderstorms. The influence of rainfall and other weather characteristics on cropping patterns and yields can be simplified for the analysis. Cocoa cannot be successfully grown in the north because of the longer dry spell. For food crops like maize variations in rainfall above a minimum level will have little effect on yields. It is, however, important to establish that this minimum level of rainfall occurred. This was confirmed by the Ghana Meteorological Services Department, Legon, for the 1979 main crop season.

3.4.5 *Crop diseases.* Data on crop diseases was collected from the farm surveys. A critical factor which has had an important impact on cocoa growing in Ghana is swollen shoot disease. The impact of the disease was particularly fierce in the Eastern Region. Although some past data of crop disease was available it was not known what impact this disease or other diseases had on current farming decisions.

3.5 *The survey villages*

Because the main data collection exercise was to be carried out by Ministry of Agriculture statistics enumerators, the choice of survey villages was limited to those villages currently part of the Ministry Survey. (The Ministry of Agriculture surveys a random sample of 15 per cent of the small scale farmers located in a random sample of villages in the Region.) From the Ministry Survey a sub-sample of 33 villages was chosen which were widely located throughout the main inhabited parts of the Region (see Fig. 1) except that the more mountainous northern and eastern areas of the Region were deliberately excluded as were the remote and uninhabited parts of the Afram Plains in the far north east of the Region.

Overall the chosen survey villages were broadly representative of the agricultural villages of the Region. Thirty one of the survey villages lay in the cocoa growing forest zone and two villages lay in the savanna zone of the Region. The survey villages lay between 8 and 102 km by road from Kumasi.

3.6 *Data collection*

3.6.1 *The main questionnaires.* Ministry enumerators administered two extra questionnaires to their normal sample of smallholders. This additional data was collected from 491 holders in the 33 selected survey villages.

The first questionnaire covered:-

- farm size
- household composition
- holder education
- labour inputs
- finance
- crop diseases
- crop production and sales
- livestock
- use of inputs
- extension contact
- farming attitudes and knowledge
- farm location
- transport of produce from farm to village
- crop storage and marketing.

The second questionnaire was administered somewhat later and collected more information on farming practice, agricultural transport, migration, children's education, but its main emphasis was concerned with access to social facilities and passenger trip frequency and purpose.

Additional data sheets were completed by enumerators covering field sizes, crop mixtures and crop yields, this data having been collected for the usual Ministry of Agriculture Survey.

3.6.2 *The village survey.* In addition to data collected by Ministry enumerators project staff visited every village to administer a village survey questionnaire and to collect soil samples. Information for the village survey questionnaire was provided by knowledgeable people in the village. This information was further cross checked by visual inspection and reconnaissance during the visit. The village survey collected information on the different occupations found in the village, public utilities, social facilities, schools and churches and travel charges to district centres and Kumasi.

3.6.3 *Soil samples.* Soil samples were collected from three farms belonging to smallholders living in the village. On each farm soil samples were taken from four locations and put together to form a composite sample. These samples were further tested at the Soil Research Institute, Kwadaso. Tests were carried out for acidity, organic matter content and available phosphorous and potassium in the soil.

3.6.4 *The survey of extension organisations.* A separate questionnaire was distributed to the eight main extension organisations working in Ashanti Region. The purpose of the questionnaire was to identify the major transport constraints of these organisations. Questions were asked on the structure of each organisation, methods of farmer contact, materials to be distributed, purchases to be made, transport vehicles available and organisational constraints.

3.6.5 *Other data.* The Ministry of Agriculture Statistics Department supplied past data on crop yields for the survey villages and data on market prices and transport charges for Ashanti Region. Other data and information was collected from the Meteorological Services Department, Ghana Highway Authority and the Central Bureau of Statistics.

3.7 *Data analysis*

The survey data from the holders was aggregated to provide statistics for each individual village; the statistics for the 33 villages are presented in the Appendix. Using this village data parameters of accessibility were tested as explanatory variables of the parameters of agricultural development using regression analysis.

4. SURVEY RESULTS

This section examines in some detail the results of the analysis of the data from the agricultural surveys. Particular emphasis is given to farm inputs, food production and cocoa. A table of the survey data used in the analysis is shown in the Appendix.

The results clearly indicate the existence of considerable variability in farming patterns between villages. This has added some difficulty in drawing precise conclusions from the analysis. In common with other socio-economic field studies the bounds of sampling error were wide and it was not possible to control perfectly for all extraneous influences.

4.1 *Population and soils in the survey area*

Regression analysis indicated that district population density and village population are unrelated to accessibility (Table 1). The apparent significance of Regression No. 1 is only because of the presence of Pankrono amongst the survey villages. Pankrono lies within the Kumasi area and as a result has the highest accessibility of all villages and a population density that is over ten times that of any other area. If Pankrono is removed from the data set the regression relationship is shown to have no significance at all.

TABLE 1

Survey area characteristics

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
district population density (J13)	1	J13 = 313.7 – 2.88J15	0.089	3.01	33	10%[1]
	2	J13 = 243.7 – 3.08J17	0.052	1.69	33	Not sig.
village population (J51)	3	J51 = 1591.7 – 2.26J15	0.003	0.086	33	Not sig.
	4	J51 = 1955.5 – 12.78J17	0.045	1.47	33	Not sig.
soil characteristics: PH level (J33)	5	J33 = 5.79 + 0.0037J15	0.05	1.27	26	Not sig.
	6	J33 = 5.82 + 0.0053J17	0.054	1.37	26	Not sig.
% organic matter (J34)	7	J34 = 3.79 – 0.0052J15	0.02	0.504	26	Not sig.
	8	J34 = 3.33 + 0.0027J17	0.003	0.067	26	Not sig.
P_2O_5 ppm (J35)	4	J35 = 62.16 – 0.021J15	0	0.01	26	Not sig.
	10	J35 = 84.26 – 0.581J17	0.174	5.065	26	5%
K_2O ppm (J36)	11	J36 = 405.5 – 1.107J15	0.022	0.536	26	Not sig.
	12	J36 = 375.1 – 1.09J17	0.011	0.265	26	Not sig.

Independent Variables:

J15 headload costs village to Kumasi, in units of ¢ $\frac{1}{10}$

J17 headload costs village to district centre in units of ¢ $\frac{1}{10}$

1. If data from Pankrono is omitted in this equation $R^2 = 0.007$ and F value = 0.223 making J15 an insignificant explanatory variable.

The soil fertility measures also show little relationship with accessibility, although phosphorus pentoxide is statistically associated in the sample with proximity to district centres. In later analysis these soil fertility measures were found to be largely unrelated to maize and cocoa yields or to crop sales although organic matter content was found to be a significant explanatory variable of cassava sales. The variation in cassava sales may be explained by changes in the level of soil nitrogen that are indicated by the soil test for organic matter content.

It is interesting to note that the two villages in the savanna soils area, Dromankuma and Sekodumasi had the expectedly lower organic matter content in their soil samples than the other villages which lay in the forest soils area.

4.2 *General holder characteristics*

In total 491 holders were surveyed in 33 villages. The holders lived in villages lying between 8 and 102 km from Kumasi; the average distance to Kumasi for the average holder was 61 km. 48 per cent of holders were male and 58 per cent of all holders were over 40 years old. The average household size was found to be 4.7 people including one child. 72 per cent of holders had no schooling at all. The average total farm size was 4.2 acres.

59 per cent of holders said their major source of livelihood was their food farm while 28 per cent claimed that this was provided by their cocoa farm. A further 9 per cent said that a non farming job provided their major source of livelihood. 36 per cent of the holders grew cocoa. The relationship between general holder characteristics and accessibility is shown in Table 2. The table shows that the proportion of holders that were over 40 years old increased with distance or travel costs from Kumasi. Similarly the proportion of holders that were male also increased with inaccessibility. Although the more accessible villages were shown to have a greater proportion of holders with elementary school certificate and above, this was not statistically significant. It may be thought that accessibility would influence economic opportunities and hence household size, but no statistical relationship was found between accessibility and the number of people in each household.

The average total farm area was found to increase with inaccesibility, this being particularly marked in terms of travel costs to district centre. Average non cocoa farm area (as well as cocoa farm area) also increased with inaccessibility.

Table 2 shows that cocoa was reported to be a more dominant source of livelihood the more remote the farming location. By contrast the proportion of holders reporting that their food farms or a non farming job were more important sources of livelihood increased with accessibility. Accessibility thus appears to be less important to cocoa farming than to food farming. The table shows that the proportion of village population over 8 years with regular jobs also increased with accessibility reflecting the greater job opportunities in the more accessible locations.

4.3 *Labour input*

Labour input into farming is shown in Table 3. Household labour input per person and per holder was found to rise with inaccessibility. There is however some evidence to suggest that household labour input per acre declined with increased transport costs to the district centre but the relationship was only significant at the 10 per cent level. This latter relationship may reflect the smaller labour demands of cocoa farms per acre because no significant relationship could be found for the two thirds of the holders that grew no cocoa.

TABLE 2

General holder characteristics

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
% holders more than 40 years old (J2)	13	J2 = 38.9 + 0.247 J15	0.174	6.53	33	2.5%
	14	J2 = 51.3 + 0.107 J17	0.017	0.525	33	Not sig.
% holder's male (J3)	15	J3 = 23.8 + 0.377 J15	0.323	14.78	33	1%
	16	J3 = 30.8 + 0.455 J17	0.24	9.81	33	1%
% holders with no education (J8)	18	J8 = 65.3 + 0.0362 J15	0.003	0.08	33	Not sig.
	19	J8 = 70.9 – 0.077 J17	0.006	0.18	33	Not sig.
% holders with elementary school cert. and above (J12)	20	J12 = 21.4 – 0.132 J15	0.10	3.42	33	10%
	21	J12 = 17.4 – 0.12 J17	0.04	1.36	33	Not sig.
average No. of people in holder's house (J11)	22	J11 = 3.98 + 0.0067 J15	0.016	0.508	33	Not sig.
	23	J11 = 4.56 – 0.0032 J17	0.002	0.058	33	Not sig.
average total farm area (J20)	24	J20 = 1.42 + 0.0366 J15	0.162	5.61	31	5%
	25	J20 = 1.21 + 0.0664 J17	0.272	10.85	31	1%
average non cocoa farm area (J25)	26	J25 = 0.914 + 0.0143 J15	0.228	8.56	31	1%
	27	J25 = 1.18 + 0.0174 J17	0.173	6.07	31	5%
% holders with cocoa as first source of livelihood (J4)	28	J4 = 0.607 + 0.405 J15	0.286	12.4	33	1%
	29	J4 = 3.18 + 0.613 J17	0.335	15.6	33	1%
% holders with non farming job as first source of livelihood (J5)	30	J5 = 19 – 0.128 J15	0.063	2.08	33	Not sig.
	31	J5 = 20.3 – 0.025 J17	0.118	4.15	33	10%
% holders with food farm as first source of livelihood (J6)	32	J6 = 81.6 – 0.312 J15	0.159	5.87	33	5%
	33	J6 = 77.2 – 0.412 J17	0.142	5.13	33	5%
% village pop. over 8 years in regular jobs (J9)	34	J9 = 11.5 – 0.063 J15	0.096	3.29	33	10%
	35	J9 = 12.6 – 0.132 J17	0.216	8.54	33	1%

Independent variables:

J15 headload costs village to Kumasi in units of ₵ $\frac{1}{10}$

J17 headload costs village to district centre in units of ₵ $\frac{1}{10}$

The average weekly household labour input into each holder's farm was estimated at 8.7 days. By contrast hired part-time labour contributed on average about 32 man days of effort for each holder for the whole farming year. Approximately 20 per cent of holders claimed that a caretaker looked after some of their land, but caretakers were only recorded for cocoa farms.

No significant simple relationship could be found between average village wage rates and accessibility. However, a multiple regression showed that average village wage rates rose with village population, transport costs to district centre and population density. This suggests that large isolated villages must pay more for farm labour than smaller more accessible villages.

TABLE 3

Labour input

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
household days worked on farm per person over 8 years (J10)	36	J10 = 2.27 + 0.011 J15	0.21	7.69	31	1%
	37	J10 = 2.37 + 0.016 J17	0.22	8.32	31	1%
total household days worked on farm per holder (J21)	38	J21 = 7.03 + 0.04 J15	0.19	6.74	31	5%
	39	J21 = 7.53 + 0.054 J17	0.18	6.28	31	5%
household days worked on farm per acre (J23)	40	J23 = 5.7 – 0.021 J15	0.066	2.05	31	Not sig.
	41	J23 = 5.8 – 0.039 J17	0.109	3.54	31	10%
non cocoa holders standardised days worked per acre (J40)	42	J40 = 8.31 – 0.005 J15	0.001	0.036	33	Not sig.
	43	J40 = 8.16 – 0.005 J17	0.0005	0.017	33	Not sig.
average village wage rate (J58)	44	J58 = 5.54 + 0.0078 J15	0.04	1.16	30	Not sig.
	43	J58 = 5.46 + 0.014 J17	0.068	2.04	30	Not sig.
	46	J58 = 4.25 + 0.00044J51)		8.54)		1%
		+ 0.025 J17)	0.366	7.22)	30	5%
		+ 0.001 J13)		3.6)		10%

Independent variables:

- J13 district population density
- J15 headload costs village to Kumasi in units of ¢ $\frac{1}{10}$
- J17 headload costs village to district centre in units of ¢ $\frac{1}{10}$
- J51 village population

4.4 *Modern inputs*

The farm surveys showed no evidence that inaccessibility prevented the use of fertilisers, tractors, or insecticide or that it prevented contact with extension workers. However, the issue is somewhat complicated by the two agricultural zones covered by the survey. Machinery hire and fertiliser use are more suited to savanna soils which are lighter and easier to plough and often less fertile than forest soils. One of the two remotely located savanna villages, Dromankuma, alone recorded 32 per cent of total extension contact, 65 per cent of total machinery hire and 75 per cent of total incidence of fertiliser use of the whole survey.

Table 4 shows that no direct significant relationship was found between extension contact or the use of cocoa insecticide and accessibility. This is unaltered even if data relating to the two savanna villages are excluded from the analysis.

TABLE 4

Modern inputs

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
% holders with extension contact (J7)	47	J7 = 5.29 + 0.066 J15	0.014	0.434	33	Not sig.
	48	J7 = 12.3 – 0.064 J17	0.007	0.207	33	Not sig.
% cocoa holders with cocoa sprayed (J52)	49	J52 = 42.5 + 0.19 J15	0.041	0.98	25	Not sig.
	50	J52 = 55.05 + 0.0037 J17	0	0	25	Not sig.

Independent variables:

J15 headload costs village to Kumasi in units of ₵ $\frac{1}{10}$

J17 headload costs village to district centre in units of ₵ $\frac{1}{10}$

Out of the 65 holders that reported extension contact 44 holders mentioned the Crops Extension Division, 17 holders mentioned Cocoa Production Division, and 2 holders mentioned Veterinary Services. In answer to a specific question on the Ashanti Cocoa Project, 16 holders (out of a total of 179 holders that grew cocoa) said they were members of the Project.

Overall it appears that the pattern of extension contact is more dependent on the local management and enthusiasm of individual extension workers than on the problems posed by inaccessibility even though the latter may well hinder directly or indirectly the overall efficiency of each extension organisation.

4.5 *Holder finance*

Holder finance is examined in Table 5. Although a simple positive relationship was found between transport costs from Kumasi and the proportion of holders that applied for financial assistance this relationship became insignificant once account was taken of holder age. A very strong positive relationship was found to exist between the proportion of holders who applied for financial help and the proportion of holders greater than 40 years old.

A different picture emerges with the success in obtaining loans. Although no significant relationship was found between accessibility and gaining a proportion of the money requested it does appear that money loaned per holder that applied was positively related to accessibility. A simple regression relationship significant at the 5 per cent level shows that cedis loaned per holder applying was positively related to accessibility to Kumasi ($R^2 = 0.18$). Further examination by multiple regression showed that this relationship was strengthened (to 1 per cent significance) once the average number of people in the holder's household and the transport costs to district centre were taken into account ($R^2 = 0.47$). Loans from both 'official' institutional sources (eg. the commercial banks) and non official sources (money lenders, friends and family) were more difficult to obtain in the more remote locations. The comparative lack of success faced by holders in the more remote villages in obtaining institutional loans may relate to the communications problem of getting the holder's field measured (a necessary part of the process) and the difficulty and expense of making follow-up trips to chase the progress of the loan. The greater difficulty in obtaining loans from 'unofficial' non institutional sources may reflect the greater scarcity of the latter sources of assistance in the more remote locations.

On average 15 per cent of all holders belonged to a loan cooperative and 22 per cent of holders had applied for financial assistance. Of those that applied for help an average of ₵191 was obtained from official sources and ₵127 from unofficial sources. (The average part time labour wage rate at the time of this survey was about ₵6.5 per man

day.) Most loans were for the duration of the agricultural crop season. In common with other surveys of this kind it was not possible to check effectively on how the loan was spent. The high rates of inflation coupled with the much lower 'official' interest charges would have provided an undoubted incentive to spend some of the low interest institutional loans on domestic consumption goods. However, it was still profitable to use the loan to expand food production.

TABLE 5

Holder finance

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
% holders that applied for finance (J41)	51	J41 = 8.6 + 0.225 J15	0.131	4.66	33	5%
	52	J41 = 19.4 + 0.108 J17	0.015	0.49	33	Not sig.
	53	J41 = −17 + 0.734 J2	0.489	29.7	33	1%[1]
cedis loaned per holder applying (J42)	54	J42 = 679 − 5.26 J15	0.185	4.75	23	5%
	55	J42 = 480 − 3.84 J17	0.05	1.12	23	Not sig.
	56	J42 = 195 − 11.6 J15)		10.3		1%
		+ 118.3 J11)	0.466	8.47	23	1%
		+ 9.61 J17)		3.67		10%
official aid as a % of total (J43)	57	J43 = 54.3 + 0.03 J15	0	0.02	23	Not sig.
	58	J43 = 52.3 + 0.1 J17	0.004	0.09	23	Not sig.
% of requested aid given (J44)	59	J44 = 62.1 + 0.15 J15	0.02	0.51	24	Not sig.
	60	J44 = 72.6 − 0.006 J17	0	0	24	Not sig.

Independent variables:

J2 per cent holders more than 40 years old
J11 average number of people in holder's house
J15 headload costs village to Kumasi in units of ₵ $\frac{1}{10}$
J17 headload costs village to district centre in units of ₵ $\frac{1}{10}$

1 Both J15 and J17 were found to be insignificant exploratory variables in a multiple regression with the other variables in this equation.

4.6 *Cocoa production*

Of the 491 holders interviewed in 33 villages, 179 holders grew cocoa in 23 villages. The largest cocoa production per holder was recorded at Mpasaso which had both the largest cocoa and non cocoa farms. At 74 km from Kumasi, Mpasaso was in the middle ranges of accessibility of villages in the sample.

Table 6 shows that the proportion of holders growing cocoa significantly increased with inaccessibility. Both the average cocoa area per holder and the proportion of total farmed area devoted to cocoa significantly increased with transport costs to the district centres. No significant, simple regression relationship was found between accessibility and cocoa sales per grower or cocoa sales per acre. However, multiple regressions show that the average cocoa sales per cocoa grower were strongly positively related to average cocoa area but negatively related to the average number of people in the holder's household ($R^2 = 0.55$). The latter may reflect the domestic food needs of the holder's household.

Average village cocoa sales per acre of cocoa farm were apparently strongly related to the balance of sexes of holders in each village. The regression suggests that women holders are relatively more successful in maintaining a higher level of productivity per acre.

Cocoa yields will decline if the trees are neglected and disease is allowed to spread. New trees need to be planted as the older trees decline in yield and die. It is interesting to note that plenty of evidence was found of new cocoa planting in the South Eastern area of the Region, an area previously affected by swollen shoot disease. Of the 179 holders growing cocoa moderate or poor yield was attributed to poor soil by 9 holders in 6 villages, to capsid attack by 15 holders in 10 villages, to black pod by 4 holders in 3 villages and to weather by 16 holders in 6 villages. No holders mentioned swollen shoot disease as a contributing factor to poor cocoa yields.

TABLE 6

Cocoa production

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
% holders growing cocoa (J55)	61	J55 = 4.23 + 0.454 J15	0.279	12.02	33	1%
	62	J55 = 7.2 + 0.685 J17	0.325	14.94	33	1%
cocoa sales per cocoa grower (J37)	63	J37 = 1870 + 4.31 J15	0.004	0.074	19	Not sig.
	64	J37 = 1220 + 23.2 J17	0.064	1.17	19	Not sig.
	65	J37 = 356 + 72 J22 − 64 J11	0.55	17.79 8.3	19	1%[1] 1%
cocoa sales per acre of cocoa farm (J38)	66	J38 = 474 − 0.81 J15	0.008	0.13	19	Not sig.
	67	J38 = 440 − 0.49 J17	0.001	0.03	19	Not sig.
	68	J38 = 1023 − 13.5 J3		80.0		1%
		+ 9.8 J7		37.6		1%
		− 62.7 J11	0.90	11.4	19	1%
		+ 8.7 J17		31.2		1%
		− 53.8 J22		11.6		1%
cocoa area as % of total farmed area (J24)	69	J24 = 20.9 + 0.19 J15	0.054	1.66	31	Not sig.
	70	J24 = 13.7 + 0.5 J17	0.188	6.73	31	5%
average cocoa area per holder (J22)	71	J22 = 0.502 + 0.022 J15	0.105	3.41	31	1%
	72	J22 = 0.031 + 0.049 J17	0.259	10.11	31	1%

Independent variables:

- J3 per cent holders that are male
- J7 per cent holders with extension contact
- J11 average number of people in holder's house
- J15 headload costs village to Kumasi in units of ¢ $\frac{1}{10}$
- J17 headload costs village to district centre in units of ¢ $\frac{1}{10}$
- J22 average cocoa area per holder

1 Both J15 and J17 were found to be insignificant explanatory variables in a multiple regression with the other variables in this equation.

4.7 *Animal husbandry*

Small numbers of poultry were kept by a very large proportion of the holders in the survey. Poultry farming on a commercial scale was reported in Koben and Mpasatia, two villages close to Kumasi. It is generally believed that commercial scale poultry farming is fairly concentrated in and nearby the major towns in the Region. The major towns provide both a market for the poultry, and are a major source of the distribution of chicken feed. Because of the shortage of chicken feed concentrate the poultry farmer is usually keen to maintain good contact with the Animal Husbandry Department to help maintain his supplies of the concentrate. In these circumstances a remote location would put the commercial poultry farmer at a distinct disadvantage.

In total 420 sheep were reportedly kept in 15 villages and 172 goats were kept in 7 villages. Table 7 shows that there was no evidence of any relationship between accessibility and ownership of sheep and goats although 25 per cent of all sheep and goats were kept in one village, Ofoase in the south east of the Region which had the longest road distance to Kumasi. This suggests that animal production is not particularly dependent on good accessibility.

As expected virtually no other animals besides chicken, sheep and goats were reportedly kept by holders in the survey.

TABLE 7

Dependent variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
No. of sheep and goats per holder (J53)	73	J53 = 0.87 + 0.007 J15	0.01	0.304	33	Not sig.
	74	J53 = 0.83 + 0.128 J17	0.016	0.51	33	Not sig.

Independent variables:

J15 headload costs village to Kumasi in units of ¢ $\frac{1}{10}$

J17 headload costs village to district centre in units of ¢ $\frac{1}{10}$

4.8 *Food production yields*

In Section 2.4 it was suggested that the overwhelming majority of food farmers in Ashanti Region practise mixed cropping. It was found in the course of the survey that the Ministry of Agriculture enumerators measured plant yields of only one food crop from the crop mixture. The combination of these two factors made it extremely difficult to estimate total food production of farmers in the Region. Data sufficient for statistical tests was collected only on maize yields. Table 8 shows that no significant relationship was found between maize yields (either per yield plot or per plant) and accessibility. It should be remembered that many other crops were grown in the same yield plots as the harvested maize plants. No statistical relationship was found between the maize yields and the soil fertility characteristics reported earlier.

In order to test the hypothesis that more accessible land, being more valuable, would be planted more intensively a separate survey on planting density was carried out. 60 locations were visited in 16 villages and plant composition and plant populations recorded in randomly placed plots. It was recognised that different plants tend to take up different amounts of land area. Even after allowing for a range of different combinations of ground area weightings for the different crops, no significant relationship was found between accessibility and overall plant density. In none of the sixty plot locations was a completely pure stand of any food crop grown.

TABLE 8

Maize yields

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
maize yield per plot (J31)	75	J31 = 17.2 – 0.027 J15	0.014	0.166	14	Not sig.
	76	J31 = 18.2 – 0.07 J17	0.048	0.6	14	Not sig.
maize yield per plant (J32)	77	J32 = 0.45 – 0.000003 J15	0	0	14	Not sig.
	78	J32 = 0.37 – 0.0018 J17	0.06	0.785	14	Not sig.

Independent variables:

J15 headload costs village to Kumasi in units of ₵ $\frac{1}{10}$

J17 headload costs village to district centre in units of ₵ $\frac{1}{10}$

4.9 *Food Crop Sales*

In the survey 55 per cent of holders reported selling maize which was more widely sold than cocoa. Only 17 per cent of holders reported selling cassava and 13 per cent reported selling plantain. Only one per cent of the holders reported selling tomatoes, cocoyam or rice. Sales of other crops were insignificant.

Table 9 shows no apparent significant relationship between maize sales and accessibility. However, cassava was sold relatively more frequently in the more accessible villages. The multiple regression shows a significant relationship between the organic content of soil, accessibility to district centre and cassava sales.

By contrast the less accessible villages reported selling more plantain. However, multiple regression analysis shows that this may be because plantain is grown on the larger mixed cocoa and food farms. Plantain is frequently interplanted with cocoa especially when the cocoa is relatively young.

Overall it appears that accessibility does not easily explain the proportion of farmers in a village selling food crops. This may more easily be explained by other factors such as the influence of household size which was found to significantly reduce the proportion of holders selling over 70 per cent of any food crop grown. Nevertheless, the proportion of farmers selling more than 30 per cent of any crop including cocoa, does apparently increase with inaccessibility although this may reflect no more than factors such as the increase in farm size and the rise in labour input per farm with inaccessibility.

4.10 *Rotten produce and accessibility*

Only 16 per cent of the survey holders could recall personal experience of their produce becoming rotten before they could sell. Three villages, Mpasatia, Mpatoam and Nyinahin (all of which had lower than average transport costs to Kumasi) accounted for 45 per cent of the reported cases.

In total less than five per cent of holders (including all those giving multiple reasons) idendified road condition as a cause for concern in this respect. Because farmers were referring to particular instances over the last few years they remembered it appears that overall only a minute proportion of produce was effectively lost because of poor road condition.

TABLE 9

Produce sales

Dependent Variable	Reg. No.	Regression equation	R^2	F Value	Observations	Significance level
% holders selling over 30% of maize crop (J27)	79	J27 = 45.6 + 0.116 J15	0.026	0.825	33	Not sig.
	80	J27 = 48 + 0.136 J17	0.018	0.573	33	Not sig.
% holders selling over 30% of cassava crop (J28)	81	J28 = 23.2 – 0.143 J15	0.116	4.08	33	5%
	82	J28 = 21.8 – 0.203 J17	0.121	4.26	33	5%
	83	J28 = 1.744 + 0.6 J34) – 0.22 J17)	0.39	10.1) 5.29)	26	5% 5%
% holders selling over 30% of all food crops (J29)	84	J29 = 70.7 + 0.14 J15	0.073	2.44	33	Not sig.
	85	J29 = 73.8 + 0.16 J17	0.048	1.56	33	Not sig.
% holders selling over 70% of all food crops (J30)	86	J30 = 51.4 – 0.024 J15	0.001	0.03	33	Not sig.
	87	J30 = 52.8 – 0.075 J17	0.005	0.15	33	Not sig.
	88	J30 = 78.8 – 6.57 J11	0.204	7.94	33	1%[1]
% holders selling over 30% of all crops inc. cocoa (J54)	89	J54 = 75 + 0.59 J15	0.307	13.76	33	1%
	90	J54 = 81 + 0.84 J17	0.317	14.39	33	1%
% holders selling over 30% of plantain crop (J57)	91	J57 = 0.81 + 0.1 J15	0.06	1.97	33	Not sig.
	92	J57 = 0.51 + 0.17 J17	0.09	3.2	33	10%
	93	J57 = –8.4 + 22.6 J26) +0.136 J55)	0.316	6.03) 3.15)	31	5%[1] 10%

Independent variables:

- J11 average number of people in holder's house
- J15 head load costs village to Kumasi in units of ₵ $\frac{1}{10}$
- J17 head load costs village to district centre in units of ₵ $\frac{1}{10}$
- J26 non cocoa growing farm area per person
- J34 percentage of organic matter content in soil
- J55 percentage of farmers growing cocoa

1 J15 and J17 were found to be insignificant explanatory variables in a multiple regression with the other variables in this equation.

4.11 *Factors affecting the expansion of production*

The survey provided an opportunity to ask holders their opinions on the factors they could identify which tended to limit the expansion of production of their food and cocoa farms. 13 per cent of holders were not interested in expanding production, often they said they were too ill or too old to do any more work. Those holders that were interested in increasing production identified three key factors which limited their farming. Financial assistance was mentioned as a constraint by 58 per cent of food farmers and by 46 per cent of cocoa farmers. Available land was mentioned as a constraint for food farming by 20 per cent of holders and for cocoa by 27 per cent of cocoa farmers. Labour was mentioned as a constraint by 16 per cent of food farmers and by 22 per cent of cocoa farmers.

5. ACCESSIBILITY TRANSPORT COSTS AND PRICES

Section 2.2 identified how a rise in farm gate prices may represent a major stimulus to increasing agricultural production. Unfortunately, it was not possible to assess accurately farm gate prices in the survey in view of the lack of records kept by farmers, the high rates of inflation, the imperfect nature of the market, and the sensitive nature of the subject. However, in order to show how prices may be expected to vary with distance the graphs in Fig. 2 give an estimate of maize prices for farms located at different distances from Kumasi. The relationships shown were derived by subtracting the wholesale transport charge and the headloading charge from the Kumasi retail market price after an allowance had been made for wholesale and retail margins.

Data relating to market prices and wholesale transport charges for August 1978 were collected from the Ministry of Agriculture Statistics Division. Headload costs were derived directly from the field survey. Following Gore[17] wholesale and retail margins were assumed to be one third of the final market price.

Kumasi Market Price		less wholesale and retail margins		gives combined farm gate and transport charge
¢91	–	($\frac{1}{3}$x market price)	=	¢60.17

From this can be subtracted the wholesale transport charge to give the farm gate price at different road distances from Kumasi and the headloading charge to give prices of headloading alone is used. The following relationship was found between wholesale transport charges and travel distance by road.

Charge per ¢ 220 lb bag of maize	= 0.485	+ 0.036 km	$R^2 = 0.88$	
		F value = 132.4	22 observations	

By contrast the charge for carrying a standard 88 lb load by headloading was ¢0.5 per kilometre.

It can be seen that at 100 km from Kumasi maize prices would be just over 6½ per cent lower for villages located on the road. A much steeper decline in price is shown for villages which can only move produce by headload.

The relative change in farm gate prices with distance for any agricultural commodity also depends on their ratios of value to weight and value to volume. The percentage change in price for the more bulky commodities may be expected to be greater than that shown for maize. However, an analysis of yam and plantain transport charges and prices showed relatively a much higher constant component and a relatively smaller variable component with distance giving a much smaller proportionate decline in price with distance. The percentage decline in price at 100 kms was little different from maize at 6.5 per cent for yam and 5.2 per cent for plantain. The regressions for yam and plantain had smaller R^2 values and were much less significant.

These figures give some guidance in helping to evaluate the practical significance of the range of accessibility measured in the survey. (31 of the 33 villages of the survey had direct access to a road or track and they were located between 8 and 102 km from Kumasi.) Although changes in farm gate prices are important they cannot be thought to represent the total impact of different levels of accessibility, changes in input prices and the other factors already mentioned such as extension, access to credit etc. must also be taken into account. The cost to the farmer of buying industrial products will also rise with inaccessibility. A more detailed analysis of transport costs and prices is included in SR 809[3].

6. DISCUSSION

The study has identified a range of factors which can influence agricultural development and it has also shown that the measurements of development is complex in Ashanti Region at the present time. It is self-evident that in the extreme, agricultural development is dependent on accessibility. If the costs of taking produce to market are too high then produce will not be grown profitably for sale. However, within the range of accessibility considered the study found that the more remote villages which were connected by roads and tracks for up to 100 km from Kumasi did not appear to have their agriculture adversely affected by their relatively higher cost of transport. Had the range of accessibility studied been much greater (for example up to 400 km from a major market but with vehicle access or up to 25 km from a road for villages without any vehicle access) then it seems reasonable to suppose that poor accessibility would have been seen to adversely affect agricultural performance, as the higher transport costs would have lead to poorer profitability of market agriculture. The policy of purchasing cocoa at a uniform price at CMB buying posts widely located throughout the region only helped to minimise the adverse effects of inaccessibility on smallholder cocoa farming.

Within the range of accessibility considered, if anything, the least accessible villages appear to be more agriculturally developed than the most accessible villages. The least accessible villages had larger farms, grew more cocoa and sold a greater proportion of the crops they produced. They also devoted more labour to farming (per member of household) than the more accessible villages. However, the overall strength of the relationships found were generally weak.

No evidence was found to suggest that the less accessible villages suffered any disadvantages in obtaining insecticide, fertiliser, using tractors or gaining extension advice. However, poor accessibility might adversely affect agriculture in an important way, through the inability to obtain finance.

Villages with better accessibility appear to be more dependent on non agricultural activities for their livelihood. The development of non agricultural activities such as rural industry and more particularly the provision of rural services are, at first sight, more likely to be dependent on good accessibility for their success. Services are very dependent on a constant turnover of new clientele and clearly could not thrive in a small remotely placed village.

The study supports the conclusion that where a road investment induces only a relatively small change in transport costs and market prices (such as would arise, for example, from the upgrading of an existing track or earth road) then correspondingly little impact on agricultural development may be expected.

7. ACKNOWLEDGEMENTS

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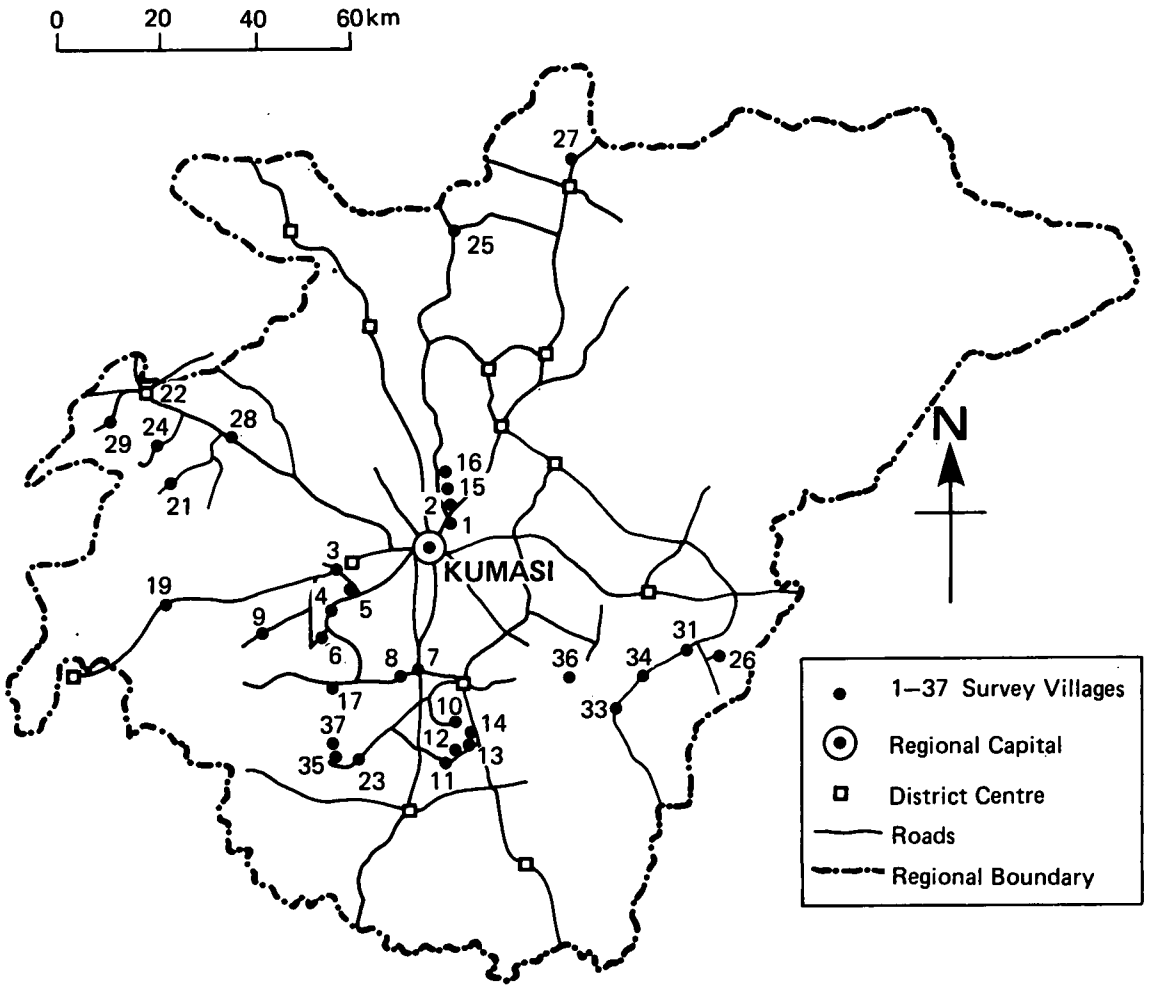

Fig. 1 A map of Ashanti Region showing location of survey villages

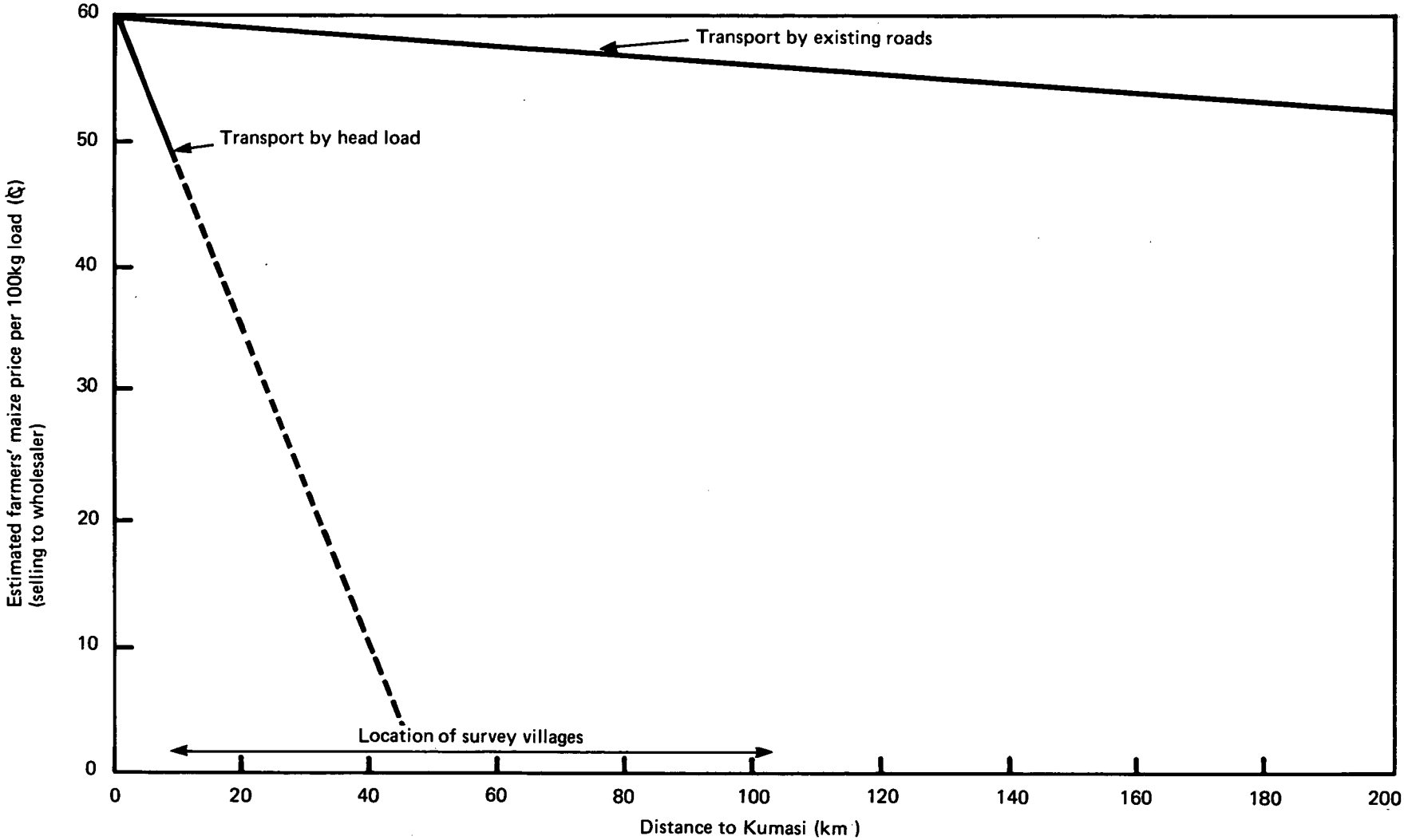

Fig. 2 A graph to show how transport costs will reduce farmers'maize price at different distances to Kumasi

9. APPENDIX

VILLAGE SURVEY DATA

The data listed here is used in the regression analysis of the main report.

The data relating to each village is grouped into 8 geographic zones for the sake of convenience. Each village is identified by its number in Figure 1.

NOTE: Variables J29, J30 and J54 are expressed as percentages but some observations are above '100'. This is because a holder is listed each time he or she sells more than 30 per cent in J29, and J54 (or 70 per cent in J30) of any crop. Hence a holder will be listed twice in J29 if he sells more than 30 per cent of two crops.

Zone	Village No.	Village name	No. of Holders	Distance to Kumasi Km	% Holders more than 40 years J2	% Holders male J3	% Holders with cocoa as first source of livelihood J4	% Holders with non farming job as first source of livelihood J5	% Holders with food farm as first source of livelihood J6
Zone 5	1	Pankrono	29	8	41	34	0	14	83
	2	Atimitim	8	9	25	38	13	0	100
	15	Maase	7	13	29	14	20	0	86
	16	Edjunase	5	14	40	20	0	0	100
Zone 2	3	Toase	10	25	30	60	0	40	60
	4	Koben	8	35	63	50	25	0	63
	5	Mpasatia	28	29	46	50	18	11	71
	6	Winiso-Sekyikrom	26	45	50	38	4	12	85
	9	Mpatoam	18	48	61	22	61	17	22
Zone 3A	7	Anwia-Nkwanta	3	31	33	33	0	0	100
	8	Huntado	14	36	50	21	7	0	93
	10	Kensere	17	49	59	53	0	6	94
	11	Akrokerri	12	51	83	42	0	42	58
	12	Brobriasi	13	52	46	38	0	39	54
	13	Kyenaboso	5	53	80	40	20	80	20
	14	Edubiasi	9	54	67	44	11	44	56
Zone 1	19	Nyinahin	12	59	33	33	58	0	42
Zone 3B	17	Chechewere	7	53	71	57	0	29	0
	23	Kente	8	71	75	38	75	0	25
	35	Ntebene	1	73	0	100	0	0	100
	36	Kokoben	13	69	85	62	54	0	46
	37	Obenebeng	9	76	22	100	67	0	33
Zone 6	21	Mpasaso	22	74	50	41	41	0	55
	22	Tepa	27	72	70	15	52	15	30
	24	Abonsuaso	35	89	54	63	40	6	20
	28	Hwibaa	17	54	77	24	35	0	59
	29	Nyambekyere	6	89	83	83	17	0	83
Zone 7	25	Sekodumasi	20	77	50	45	10	5	85
	27	Dromankuma	26	84	85	92	0	8	92
Zone 4	26	Kyempo	15	90	64	53	53	0	47
	31	Odubi	9	82	67	100	89	0	11
	33	Ofoase	30	102	63	60	23	3	73
	34	Dwendwenase	22	96	82	64	73	0	27

Village No.	% Holders with extension contact	% Holders with no education	% Village pop. over 8 years in regular jobs	Household days worked on farm per person over 8 years	Average No. of people in holders house	% Holders with elementary school cert. and above	District population density Pop/Sq. Km	Headload costs village to Kumasi ¢	Headload costs farm to Kumasi ¢
	J7	J8	J9	J10	J11	J12	J13	J15	J16
1	0	79.3	13.8	2.83	2.62	3.4	2054	0.9	–
2	0	37.5	11.1	2.45	2.25	50.0	56	1.5	3.5
15	0	0.0	13.3	2.34	2.57	57.1	56	1.9	6.9
16	0	60.0	25.0	2.50	1.60	20.0	56	1.9	–
3	40	40.0	17.2	2.07	3.70	10.0	67	1.9	3.2
4	20	87.5	8.5	1.86	7.75	0.0	67	2.8	4.2
5	7	60.7	11.1	2.70	5.71	14.3	67	3.7	5.2
6	6	73.9	3.0	2.95	4.12	26.9	100	3.7	8.7
9	0	77.8	2.8	2.40	6.28	11.1	57	5.6	7.1
7	0	100.0	0.0	4.17	2.00	0.0	57	3.7	4.6
8	0	92.9	8.3	3.14	3.21	7.1	57	5.6	6.3
10	0	82.4	4.8	2.67	5.88	5.9	198	5.6	8.6
11	0	33.3	10.5	2.42	3.58	33.3	45	5.6	–
12	0	81.8	0.0	1.97	5.46	18.2	45	5.6	10.6
13	0	80.0	0.0	2.11	5.80	0.0	45	5.6	7.6
14	0	87.5	2.4	2.17	4.88	12.5	30	5.6	7.9
19	0	66.7	7.5	3.19	5.58	16.7	24	5.6	8.3
17	0	85.7	6.6	3.73	6.57	0.0	57	5.6	7.0
23	5	87.5	0.0	3.54	5.13	12.5	42	8.3	9.3
35	0	0.0	0.0	6.00	1.00	0.0	42	9.8	10.8
36	8	84.6	5.6	3.35	7.08	7.7	72	13.3	17.0
37	0	55.6	0.0	4.41	2.66	0.0	44	10.5	11.3
21	0	81.0	0.0	2.8	4.05	4.8	57	7.4	9.3
22	41	88.9	24.5	–	9.74	7.4	57	7.4	9.4
24	30	25.0	0.0	4.02	2.23	50.0	57	9.3	11.0
28	15	100.0	7.7	–	5.41	0.0	49	8.3	12.1
29	0	83.3	21.5	3.61	3.71	0.0	49	9.3	–
25	53	80.0	11.1	2.34	4.35	10.0	30	9.3	15.2
27	92	52.0	1.0	3.00	4.69	0.0	30	9.3	12.7
26	0	66.7	0.0	3.85	3.46	8.3	67	9.3	11.9
31	0	87.5	13.3	3.13	4.66	12.5	67	11.1	16.9
33	5	63.3	8.7	2.36	4.80	6.7	67	13.0	15.4
34	0	53.3	1.4	3.85	4.18	6.7	67	14.8	18.7

Village No.	Headload costs village to district centre ¢ J17	Average total farm area acres J20	Total household days worked on farm per holder J21	Average cocoa area per holder acres J22	Household days worked on farm per acre J23	Cocoa area as percentage of total farmed area J24	Average non cocoa farm area acres J25	Non cocoa farm area per person acres J26	% Holders selling over 30% of maize crop J27
1	0.9	0.49	6.34	0.0	12.9	0	0.49	0.19	70
2	1.5	2.58	5.51	1.88	2.1	73	0.70	0.31	38
15	1.9	1.56	5.00	0.0	3.2	0	1.56	0.61	29
16	1.9	0.78	4.00	0.0	5.1	0	0.78	0.49	0
3	1.9	2.92	6.00	2.12	2.1	76	0.80	0.22	80
4	2.8	5.70	14.40	3.90	2.5	44	1.80	0.23	75
5	0.7	7.24	10.43	3.53	1.4	19	3.71	0.65	14
6	3.7	1.64	7.48	0.05	4.6	3	1.59	0.39	46
9	5.6	3.63	9.47	2.44	2.6	67	1.19	0.19	72
7	1.9	1.03	8.33	0.0	8.1	0	1.03	0.52	100
8	1.9	1.56	8.50	0.46	5.5	29	1.10	0.34	71
10	1.9	1.60	13.04	0.0	8.2	0	1.60	0.27	53
11	1.9	1.02	7.66	0.0	7.5	0	1.02	0.29	25
12	1.9	1.39	9.25	0.60	6.7	43	0.79	0.15	23
13	2.8	2.58	11.40	0.0	4.4	0	2.58	0.45	60
14	2.8	1.77	9.86	0.71	5.6	40	1.06	0.22	33
19	5.6	7.69	14.08	5.08	1.8	66	2.61	0.47	33
17	3.7	8.25	16.00	5.82	1.9	70	2.43	0.37	71
23	5.6	1.50	13.28	0.95	8.9	63	0.55	0.11	50
35	7.1	0.60	6.00	0.0	10.0	0	0.60	0.60	100
36	10.1	7.32	18.31	4.54	2.5	62	2.78	0.96	39
37	7.7	2.06	10.28	0.84	5.0	41	1.22	0.46	11
21	7.4	12.91	8.27	8.85	0.6	69	4.06	1.00	64
22	0.0	–	–	–	–	–	–	–	56
24	5.6	4.17	7.35	2.71	1.8	65	1.46	0.66	46
28	3.7	–	–	–	–	–	–	–	65
29	3.7	2.12	8.40	0.0	3.9	0	2.12	0.67	33
25	5.6	3.01	8.44	0.23	2.8	8	2.78	0.64	75
27	5.6	2.86	10.73	0.0	3.7	0	2.87	0.61	92
26	5.6	7.30	10.29	3.43	1.4	47	3.87	1.12	20
31	5.6	8.49	10.43	5.04	1.2	59	3.45	0.74	78
33	7.4	3.88	10.00	1.32	2.6	34	2.56	0.53	67
34	9.3	10.91	12.77	7.74	1.2	71	3.17	0.76	77

Village No.	% Holders selling over 30% of cassava crop J28	% Holders selling over 30% of all food crops J29	% Holders selling over 70% of all food crops J30	Maize yield per plot lbs J31	Maize yield per plant lbs J32	Soil PH level J33	Soil % organic matter J34	Soil P_2O_5 ppm J35	Soil k_2O ppm J36	Cocoa sales per cocoa grower ¢ J37
1	31	101	93	8.5	0.280	6.5	2.7	34	166	–
2	13	50	25	–	–	–	–	–	–	–
15	14	43	29	–	–	–	–	–	–	–
16	40	40	40	–	–	–	–	–	–	–
3	10	100	60	12.5	0.263	5.8	3.1	31	329	1,100
4	0	88	63	–	–	–	–	–	–	700
5	39	89	93	30.8	0.299	5.5	1.9	65	846	1,700
6	15	81	15	12.3	0.480	7.1	4.4	73	144	700
9	0	78	28	24.5	0.851	6.0	4.2	36	86	2,900
7	0	100	100	–	–	5.4	3.3	47	645	–
8	7	93	86	–	–	6.5	3.7	72	710	–
10	35	88	41	9.4	0.430	5.7	3.0	86	660	–
11	33	58	17	–	–	5.6	3.9	107	154	–
12	46	69	39	–	–	6.1	5.7	58	84	–
13	0	60	20	–	–	–	–	–	–	1,300
14	11	44	22	–	–	–	–	–	–	600
19	50	92	25	19.9	0.671	5.4	7.2	23	137	2,000
17	0	86	20	7.0	0.650	5.4	3.1	60	697	2,000
23	0	75	40	–	–	–	–	–	–	1,700
35	0	100	100	–	–	6.7	4.6	88	563	–
36	8	62	23	13.6	0.436	5.9	2.7	39	733	1,100
37	0	67	56	–	–	5.7	2.9	64	700	200
21	5	82	64	–	–	5.3	3.1	39	287	10,800
22	7	63	19	–	–	5.5	3.0	204	280	–
24	20	86	89	–	–	6.9	4.1	32	288	5,100
28	24	94	47	19.2	0.205	6.9	5.4	52	503	–
29	0	83	83	–	–	5.2	2.4	43	130	–
25	5	90	80	7.9	0.372	5.9	2.0	48	74	2,400
27	0	96	65	29.4	0.467	6.1	0.9	86	75	–
26	7	100	53	–	–	6.6	2.4	44	61	1,500
31	11	100	44	–	–	5.8	3.2	48	68	1,300
33	7	87	47	15.2	0.540	6.3	2.8	64	82	1,400
34	9	100	18	5.3	0.286	7.1	3.8	37	99	2,500

Village No.	Cocoa sales per acre of cocoa farm ¢ J38	Non cocoa holders standardised days worked per acre J40	% Holders that applied for finance J41	Cedis loaned per holder applying ¢ J42	Official aid as percentage of total J43	Percent of requested aid given J44	Village population J51	Percent of cocoa holders with cocoa sprayed J52
1	–	11.67	0	–	–	–	2,080	–
2	–	7.03	0	–	–	–	836	100
15	–	6.17	0	–	–	–	1,203	0
16	–	5.29	0	–	–	–	290	–
3	105	7.85	0	–	–	–	–	50
4	107	8.48	50	2,284	56	100	1,714	60
5	185	10.47	30	190	14	57	608	18
6	1,029	4.54	0	–	–	–	903	9
9	885	9.89	44	280	54	10	1,800	69
7	–	8.68	0	–	–	–	576	–
8	–	7.84	15	100	0	2	810	100
10	–	8.39	6	400	100	100	1,177	–
11	–	8.34	50	250	73	44	3,167	–
12	–	6.97	46	433	81	81	903	–
13	427	5.60	40	350	57	100	136	100
14	427	5.56	33	400	100	67	3,093	100
19	228	19.96	17	75	100	36	4,816	14
17	276	12.03	43	360	0	10	301	0
23	637	5.25	25	290	14	100	145	50
35	–	8.87	0	–	–	–	112	–
36	66	24.67	38	76	48	100	461	50
37	73	4.88	11	150	100	100	115	29
21	497	3.09	0	–	–	–	1,305	56
22	–	21.18	30	161	59	124	6,696	71
24	761	4.36	3	290	14	100	834	79
28	–	7.45	59	100	0	100	900	60
29	–	4.66	67	300	25	92	253	50
25	1,190	3.29	0	–	–	–	5,075	0
27	–	1.61	15	225	100	36	787	–
26	284	3.53	33	112	100	35	410	67
31	194	3.50	56	180	0	100	716	71
33	313	9.34	10	253	26	95	2,038	87
34	295	8.87	64	178	100	47	1,166	90

Village No.	No. of sheep and goats per holder	% Holders selling over 30% of all crops (inc. cocoa)	Percent of holders growing cocoa	% Holders selling over 30% of plantain crop	Average village wage rate ¢
	J53	J54	J55	J57	J58
1	0.0	101	0	0	8.00
2	0.0	63	13	0	5.00
15	0.0	57	14	0	5.00
16	0.0	40	0	0	5.00
3	0.0	120	20	0	
4	2.0	151	63	13	5.86
5	1.4	125	36	32	6.50
6	2.5	89	8	14	4.12
9	2.5	150	72	0	5.86
7	0.0	100	0	0	6.00
8	0.4	100	7	0	5.00
10	1.5	88	0	0	4.75
11	0.3	58	0	0	8.00
12	0.2	69	0	0	–
13	11.0	80	20	0	–
14	0.0	55	11	0	–
19	1.1	150	58	8	6.82
17	0.0	157	71	0	5.33
23	9.6	150	75	25	6.50
35	0.0	100	0	0	5.00
36	0.0	139	77	15	4.89
37	3.4	145	78	56	5.00
21	0.3	123	41	14	9.50
22	0.3	130	67	0	5.91
24	0.2	126	40	9	5.04
28	0.0	159	65	0	6.13
29	0.0	100	17	0	4.33
25	1.6	110	20	0	9.08
27	0.0	96	0	0	6.00
26	0.0	167	67	73	8.00
31	1.3	178	78	0	5.00
33	4.9	134	47	13	8.00
34	0.0	186	86	14	8.00

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ABSTRACT

ACCESSIBILITY AND AGRICULTURAL DEVELOPMENT IN THE ASHANTI REGION OF GHANA. *J L Hine, J D N Riverson and E A Kwakye:* Department of the Environment Department of Transport, TRRL Supplementary Report 791: Crowthorne 1983 (Transport and Road Research Laboratory). The report examines the relationship between agricultural development and accessibility in the Ashanti Region of Ghana. A wide variety of factors are identified that can influence agricultural development in the Region and some of the problems of its measurement are highlighted.

Using a cross sectional framework of analysis, data was collected from 33 villages (all but two with vehicle access) in the Ashanti Region of Ghana located between 8 and 102 km from the Regional Capital, Kumasi. By comparing a number of development parameters and the transport costs of moving farm produce between each village and Kumasi (and also between each village and its respective district centre) the link between accessibility and agricultural development was investigated.

Within the range of accessibility considered little evidence was found to indicate that market agriculture was promoted directly by accessibility. However, loan finance was easier to obtain the nearer the farmer lived to Kumasi.

Overall there is evidence to suggest that the most accessible villages tended to concentrate more on non agricultural activites (such as rural industry and the provision of services, including marketing) while the less accessible villages concentrated rather more on agriculture. The study supports the view that where road investment can induce only a small change in transport costs then little impact on agricultural development may be expected.

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