PILOT STUDY ON FIRST MILE TRANSPORT CHALLENGES IN THE ONION SMALL HOLDER SECTOR

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Report Summary

This report contains the results of a small scale pilot study on the transport challenges confronted by small scale holder onion farmers in moving their produce between their farms and the roadside collection points. The study was carried out in Kieni area of Nyeri County, Kenya, in the months of April to June 2014. Onions are one of the various high value but perishable commodities being grown by small holders in the highland areas of Kenya. Roadside consolidation of produce into viable volumes requires a good local transport system and coordination with traders who collect produce for outward transport to the main markets. The transport chains in the commercial small holder sector in Kenya can be described using the following simplified structure: (1) A primary transport segment from the farm to a collection/consolidation point typically found at the key junctions of a motorable (low volume) road. Key actors in the transport system are the farmers who use their own (household) based means of transport such as human labour, animal carts, bicycles and sometimes motorcycles. (2) An intermediate transport segment - that is from the primary collection points to an intermediate traders market (in the case of onions, potatoes and bananas) or a cooling point (for French Beans). Key actors in this segment are the better of farmers (also doubling up as traders) wholesaling companies and transporters. (3) Transport to terminal delivery through main arterial road networks for national and international markets). Key actors here are transporters and traders. Each of the above transport segments has distinct challenges and associated transport costs. From the point of view of AFCAP's focus on rural access, the downstream transport segment – between the small holder farm and the first commercial interface (collection point, or primary market) is of particular interest. We refer to this transport segment as the First Mile.

The study provides:

- An analysis of the transport costs of the First mile
- An analysis of the various means of transport used in the 1st mile, their payloads and transport costs (per ton/km)
- Gender division of transport labour.
- Average distances covered in the 1st mile
- The condition of infrastructure in 1st mile

Produced together with this report is a short documentary that provides a dynamic and visual view of the transport challenges that were being investigated.

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Abstract

Despite its importance very little quantitative information is available on the harvesting and load movement of small holder agriculture. The First Mile project is designed, as an exploratory pilot project, to collect a range of data on the transport of harvest produce including consignment size, frequency of collection, mode of transport used at different stages, transport costs, transport losses, load consolidation, etc.

With better analysis and understanding of how harvest produce is taken to market and the major constraints involved, a comprehensive view on how to improve the initial stages of movement should emerge that takes into account both rural transport infrastructure and services.

As exploratory pilot research the First Mile project has concentrated on the initial movements of onions in the Aberdare Mountains of Kenya, hence the immediate direct benefits will be necessarily limited.

However the work has provided an opportunity to refine the research methodology and survey instruments so that a larger scale survey, covering a much wider range of locations and crops, may be carried out with greater confidence later on. The benefits of this research should eventually lead to:

- Better advice to road planners on the best location for improvements and a quantification of benefits of better initial access.
- A framework to provide advice to farmers and the authorities on best pattern of transport and marketing solutions in different circumstances, covering means of transport, consignment size, and the pattern and location of load consolidation and markets.
- Better understanding of the role of different forms of transport in agricultural marketing and the best ways and needs to regulate them.

1.0 INTRODUCTION TO THE PROJECT

This report is in respect of Project Reference Number AFCAP/GEN/147 implemented by the International Forum for Rural Transport and Development (IFRTD) with financial and technical support from the Africa Community Access Programme (AFCAP). The study was implemented by an IFRTD team of Peter Njenga and Grace Wahome, with support from John Hine. Support in analysing the data was provided by Dr. Romanus Opiyo of University of Nairobi while Kelvin Gitonga and Peter Kaberere implemented the field surveys.

The project was a small scale pilot study on the transport challenges confronted by small scale holder onion farmers in moving their produce between their farms and the roadside collection points. The study was carried out in Kieni area of Nyeri County, Kenya, in the months of April to June 2014.

Together with this report is short documentary that provides a dynamic and visual view of the transport challenges that were being investigated. The Documentary titled *The First Mile* can be downloaded from www.ifrtd.org and www.afcap.org.

Onions are one of the various high value but perishable commodities being grown by small holders in the highland areas of Kenya. Fuelled by growing urbanisation in the country, demand for such commodities as onions, french beans, irish potatoes etc are helping farmers transition from traditional staples to market oriented production. This process is helping lift many rural farmers from poverty and into a better quality of life.

A precondition for reaping good returns from growing high-value products is reliability of transport services linking farmers to the markets. Roadside consolidation of produce into viable volumes requires a good local transport system and coordination with traders who collect produce for outward transport to the main markets.

1.1 The Concept of the First Mile

The transport chains in the commercial small holder sector in Kenya can be described using the following simplified structure:

- *A primary transport* segment from the farm to a collection/consolidation point typically found at the key junctions of a motorable (low volume) road. Key actors in the transport system are the farmers who use their own (household) based means of transport such as human labour, animal carts, bicycles and sometimes motorcycles.

- *An intermediate transport segment* - that is from the primary collection points to the an intermediate traders market (in the case of onions, potatoes and bananas) or a cooling point (for French Beans). Key actors in this segment are the better of farmers (also doubling up as traders) wholesaling companies and transporters.

- *Transport to terminal delivery* through main arterial road networks for national and international markets). Key actors here are transporters and traders.

Each of the above transport segments has distinct challenges and associated transport costs. From the point of view of AFCAP's focus on rural access, the downstream transport segment – between the small holder farm and the first commercial interface (collection point, or primary market) is of particular interest.

We refer to this transport segment as the ***First Mile.***

Transport here is conducted on local paths and tracks that are typically in very poor condition and are particularly treacherous in the rainy season. Transport roles are gendered with women head loading and men using Intermediate Means of Transport.

Because of the low individual volumes transported and the poor condition of the road infrastructure, the first mile is the most inefficient in terms of travel speeds and transport costs. Compounding the transport challenges here is the quick rate of produce deterioration for perishable goods

1.2. Objectives of the Study

Using the case study of onion farmers in Kieni area of Kenya, highlight the transport challenges experienced by small holder farmers in the First Mile. The study provides

- An analysis of the transport costs of the First mile
- An analysis of the various means of transport used in the 1st mile, their payloads and transport costs (per ton/km)
- Gender division of transport labour.
- Average distances covered in the 1st mile
- The condition of infrastructure in 1st mile

2.0 BACKGROUND AND CONTEXT

There is a growing awareness that rural infrastructure, including the location and standards of roads and markets, needs to be planned together with transport services, in order to minimise transport costs, reduce crop wastage and gain the maximum advantage for rural farmers, transporters and urban consumers.

Up until now both infrastructure and transport services have tended to develop in a rather piecemeal and organic fashion, in large part reflecting the farming, transport and marketing demands of the extractive economics of days gone by. The authorities often tend to respond with improving roads and tracks once traffic volumes have reached certain thresholds. There is usually little cost benefit analysis, or understanding how seasonally impassable roads adversely affect agricultural marketing or the social demands of the rural population, especially the small holder farmers.

Just as agriculture is changing with the increasing use of modern inputs (seeds, fertiliser, insecticides), there are also changes in the availability and costs of transport vehicles including bicycles, motorcycles, trucks and buses and in marketing practices. Undoubtedly the biggest change in rural transport now taking place in Africa, is the growth of motorcycles. For example in 2008 there were 130,307 motorcycles and registered in Kenya but by 2012 this had grown to 610,056 registrations (Kenya Bureau of Statistics, 2013). This increase has been aided both by the recent increases in incomes in Africa, coupled with the availability of lower priced motorcycles from China and India.

Another important factor change is the widespread use of mobile phones in rural areas. Now a customer can call the motorcycle driver directly to the house for a pickup, whereas previously this was impossible to do.

Domestic supermarkets are taking a growing share of the total market share, and increasingly are establishing new long term relationships with farmers whereby produce is harvested and quickly taken for final distribution, avoiding intermediate markets and consolidation. Likewise the adoption of higher value export crops - particularly green beans, flowers, mangoes, pineapples – is also changing the patterns of harvesting, transport and marketing.

One model that is gaining popularity among small holders is contract farming, where small scale farmers enter into an agreement with typically an adjoining medium scale farmer to boost up volumes in an area. Here the farmers agree to supply produce to marketing and processing firms through forward agreements often at pre-determined prices. This can reduce the insecurity of both buyers and sellers. In some contract farming schemes, the buyer may provide inputs, credit, and technical advice. The buyer also guarantees transport at designated collection points with the farmer still responsible for the 1st mile transport.

Farmers are also responding to new markets in supplying high value products to foreign markets such as fruit, vegetables, fish and flowers. These require modern supply chain management, involving quality control, cold storage, careful packing, and timely transport to meet specific flight schedules. Supermarkets like to work with medium and large scale farmers, however, in Kenya 75% of fruit and vegetables come from small farmers. (Sieber, 2009)

The initial stages of crop movement, from collection at the farm to secondary roads, are the most expensive when expressed in tonne/ km terms and provide the biggest transport constraints to the development of agriculture. A study of selected small holder value chains in Kenya (KENDAT et al - 2013) shows that the down-stream first mile distance can make up to 1/5 of the total transport costs of a transport chain. These initial movements will usually take place on local paths and tracks and may involve carrying (by head load or on back load), or by IMTs such as animal transport, bicycles or motorbikes, and then final transfer to light goods or multi-purpose vehicles.

The process is time consuming and expensive, when either the opportunity cost of labour, or the cost of hired labour or hired transport, is taken into account. Head loading, for example, was found to be in the order of 10 to 30 times more expensive per tonne/ km than moving goods by truck.

Transport efficiency is not only important for improving financial and time costs in the delivery of inputs and produce, but also, in reducing post-harvest losses. Many crops such as tomatoes, mangos, soft fruit, green vegetables, bananas and even crops like onions can be bruised and loose value as they are man-handled and transported over rough roads. Other crops will also lose value through time delays in getting to the market; factory milk is particularly sensitive. The pattern of transport may vary greatly between periods when the roads are dry or wet. During the wet season many tracks and roads will become impassable to conventional motor vehicles creating additional problems which results in extending the first mile transport and increasing costs.

For most farmers, with limited loads to harvest, load consolidation at markets, buying posts or bus and truck stops is crucial in order to gain the advantages of the economies of scale and lower transport costs of larger vehicles.

Despite its importance very little quantitative information is available on the harvesting and load movement of small holder agriculture. The First Mile project is designed, as an exploratory pilot project, to collect a range of data on the transport of harvest produce including consignment size, frequency of collection, mode of transport used at different stages, transport costs, transport losses, load consolidation, etc.

With better analysis and understanding of how harvest produce is taken to market and the major constraints involved, a comprehensive view on how to improve the initial stages of movement should emerge that takes into account both rural transport infrastructure and services.

As exploratory pilot research the First Mile project has concentrated on the initial movements of onions in the Aberdare Mountains of Kenya, hence the immediate direct benefits will be necessarily limited.

However the work has provided an opportunity to refine the research methodology and survey instruments so that a larger scale survey, covering a much wider range of locations and crops, may be carried out with greater confidence later on. The benefits of this research should eventually lead to:

- Better advice to road planners on the best location for improvements and a quantification of benefits of better initial access.
- A framework to provide advice to farmers and the authorities on best pattern of transport and marketing solutions in different circumstances, covering means of transport, consignment size, and the pattern and location of load consolidation and markets.

- Better understanding of the role of different forms of transport in agricultural marketing and the best ways and needs to regulate them

3. THE SURVEY PROCEDURE

Five different pilot survey instruments were administered in an area covering six villages in the study area. The villages chosen were known for their growing of onions and onion farmers were specifically chosen as respondents in the farmer survey.

The study combined both qualitative and quantitative methods. The quantitative method consisted of questionnaire based surveys distributed as follows:

- A farmers survey (35 interviews)
- A transporters survey (13 interviews)
- A traffic survey (934 movements recorded in 2 locations, on one day; 6 am to 6 pm)

Traffic counts were conducted on two points one on the rural access road just after the main trading center of Kiawara and the other on a minor but motorable road off the main rural access road.

The fourth instrument consisted of Focus Group Discussions. This was conducted with farmers groups who included constituent farmers' groups as well and the overall umbrella farmers group. Most of these groups were started as a way of improving their bargaining position with traders by having a joint platform to negotiate prices. They are able to call the traders when they have consolidated their volumes. One constituent group, known as Kaarage Bara, was started to help the farmers improve the roads in the area for farmers to transport their produces to the market with ease.

Three smaller farmers group took part in the first Focus Group Discussions, with an attendance of 22 famers, 15 men and 7 women. The meeting of the umbrella group was attended by 37 people including the area chief and sub-chief. There were a total of 25 men and 12 women.
The groups were broken down into separate groups of men, women and the youth. Finally, semi-structured key informant interviews were conducted with the divisional agricultural officer and the village chief and assistant chief.

Since the study area is relatively small and the onion farmers are relatively homogeneous, the questionnaires to farmers were administered randomly across the sub-location. It was felt that a range of information on the general transport issues faced by farmers would be learnt from the individual farmers and the farmer's associations.

From the outset it was recognised that onions are not the most sensitive crop to loss during the transport process. Onions can be stored: however, it was found during the survey, they can also lose some value through bruising from excessive shaking or manhandling while being transported.

The survey forms are given in the Appendix 1-6.

4.0 STUDY AREA

The study is known as Kiamunyuru sub-location consisting of 6 small villages. It is located to the North West of Nyeri County, 30Km from Nyeri town and 9 km from Kiawara which is the nearest trading center. The area is 2500-3000 meters above sea level and is located on the slopes of the Aberdare Ranges. The area receives two rainfall seasons. The long rains occur between March and May and short rain from October to December. The annual rainfall in Kieni ranges from 550-950 mm. The driest month is July when monthly rainfall is at times as low as 00mm while the mean annual temperature of the study area is 21^0C.

The terrain is ragged and is characterized by ridges and valleys. In some areas the slope gradient is more than 45%. The nature of the terrain in Kimunyuru is a challenge to the transportation system during both the rainy and sunny seasons.

The black cotton clay soil type is most common in the area and provides favorable conditions for onion growing. Next to onions in order of commercial importance in the areas are potatoes, beans and wheat.

4.1 Population

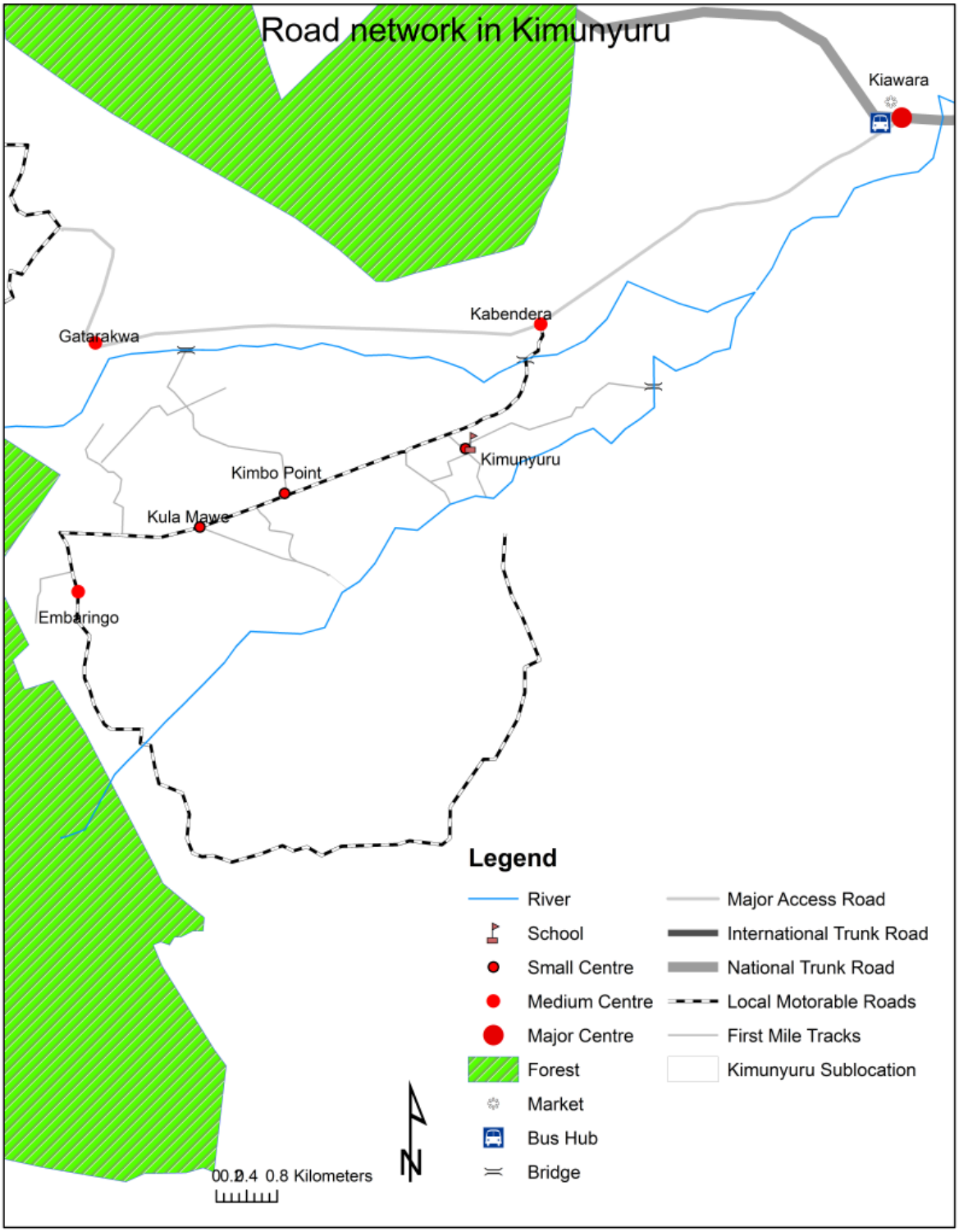
According to data from the areas assistant Chief's office, the total population of the sub-location is 2258 persons which is unevenly distributed among the 6 villages. Nganoini village has the highest number of people while Karage has the least at 502 and 175 persons respectively. The average household size of the sub-location is 5.5 persons/household and a total of 407 households.

The rate of migration is unknown though land buying rate have increased in the recent years due to availability of land and the high productivity of the area.

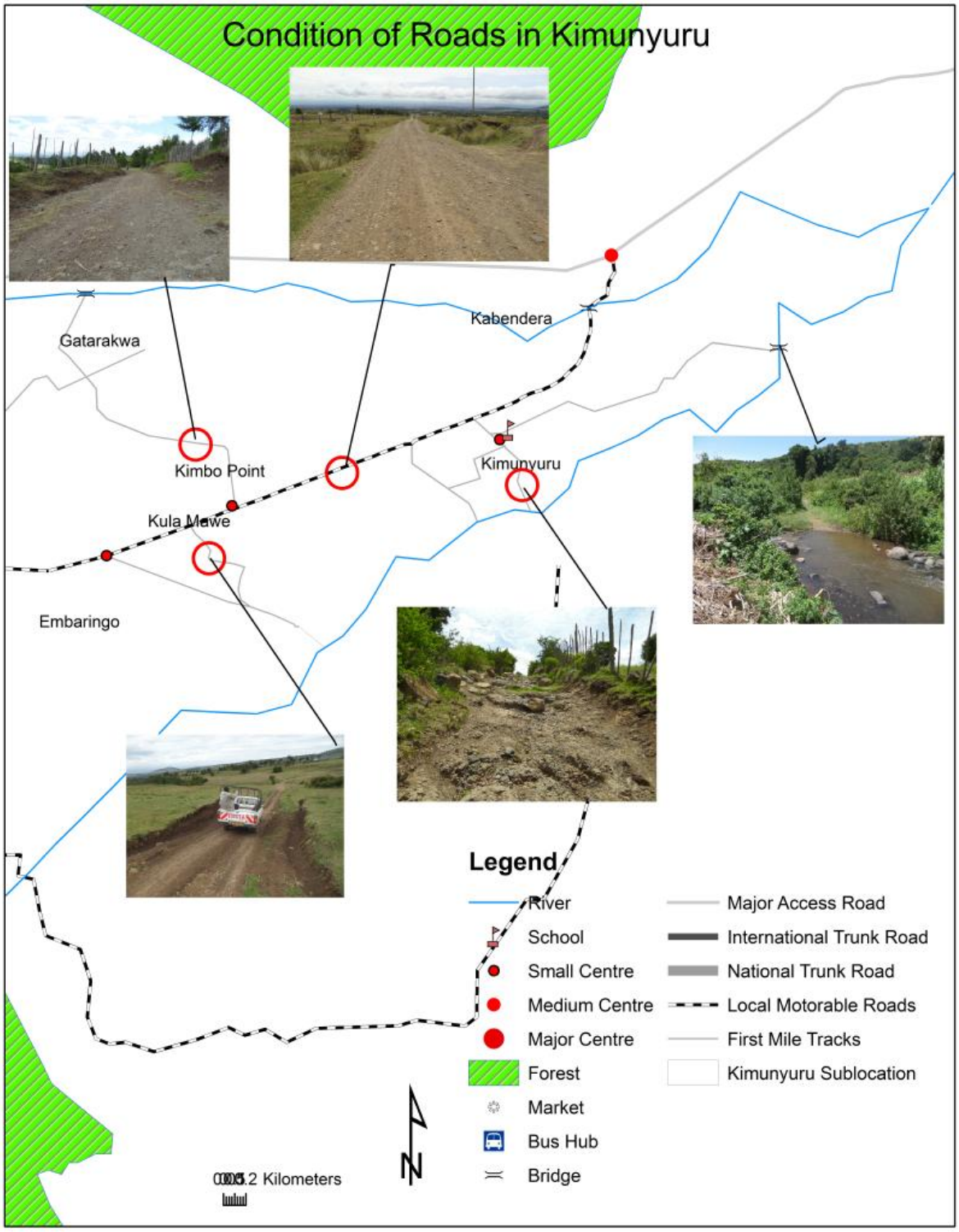
4.2 The Road Network

Kimunyuru sub-location area is linked to a national trunk road by a series of a class D rural access roads and a murram surface motorable road. The national trunk road is 9 kms away from the study area.

The villages are linked by a network of unclassified access tracks which can be seen in Map 1 below. Most of the first mile tracks are impassable during the rainy seasons and are rarely maintained.



Map 1: Road Network



Map 2: Condition of Roads

5.0 SURVEY FINDINGS

5.1 The Farmers Survey Results

Background information about the farmers is provided in Figures 1 and 2 and Table 1. It can be seen that the farmers are predominant middle aged men, with primary education. However there are significant numbers of women, also many farmers have secondary education.

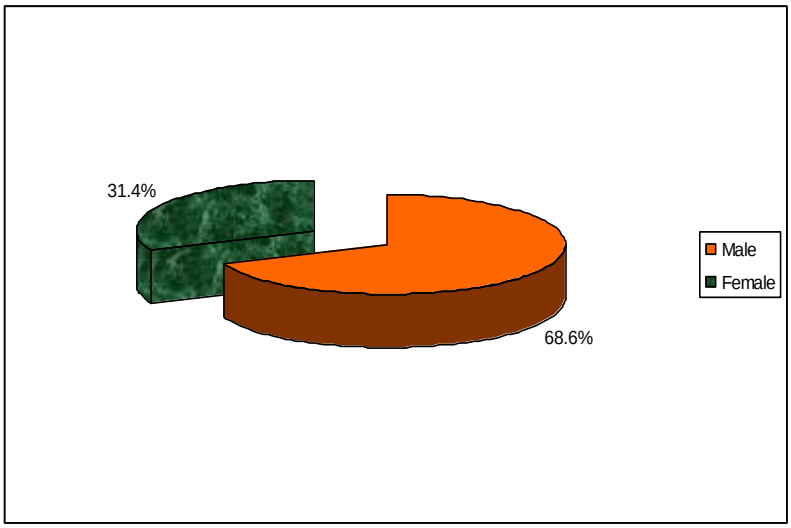


Figure 1: Farmers' Gender

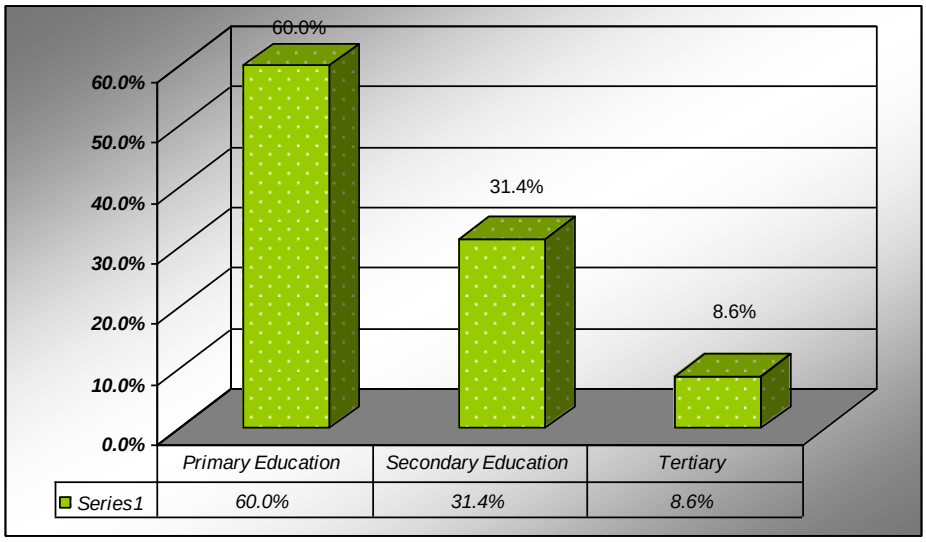


Figure 2: Farmers' Education Level

Age in Years	Frequency	Percent
20-29	4	11.6
30-39	8	23.2
40-49	12	34.8
50-59	3	8.7
60 and above	2	5.8
No response	2	5.7
Total	**35**	**100.0**

Table 1: Farmers Age

5.2 The Farms and Crops Grown

Most of the farmland is owned by the farmers as freehold (Figure 3). Over 80% of the onion farmland was in holdings of under two acres (Table 2). Most farmers grow other crops, besides onions the most common of which are potatoes, beans and maize (Figure 4). However for 85% of farmers, onions account for the majority of their farming income and for 65% of farmers this amounts to over 75% of their agricultural income (Figure 5). The farmers reported an average income of 112,000 Kenyan Shillings (US$1281)[1] per acre, against direct production costs (i.e. covering seeds, fertiliser hired labour) of 37,000 Kenyan Shillings (US$423) per acre this translates to an average profit of 75,000 Kenyan Shillings (US$858).

The farmers prefer growing onions as they are more disease resistant, grow over a short period and are more profitable than other crops such as wheat and maize.

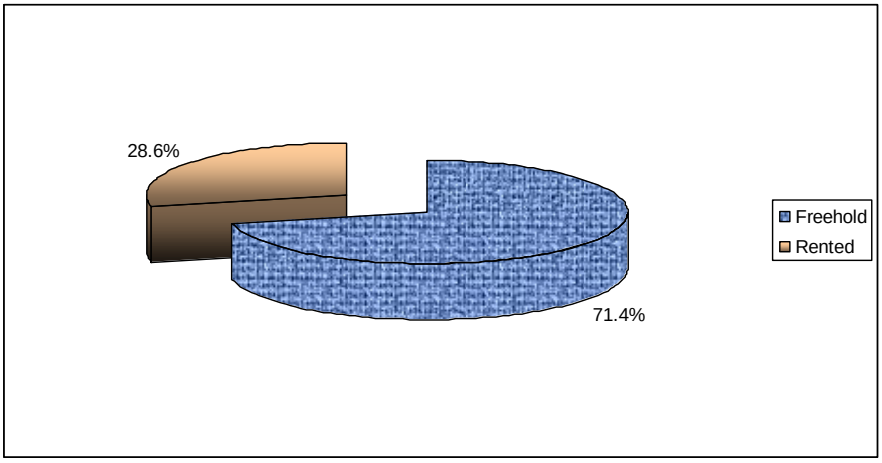


Figure 3: Farm Ownership

[1] 1US$=KSHS87 (June 2014)

Onion Farming Land Estimation in Acres	Frequency	Percent
Less than an 1 Acre	17	48.6
1- 1.9 acres	12	34.3
2- 2.9 acres	4	11.4
3 acres and above	2	5.7
Total	**35**	**100.0**

Table 2: The Size of Farms Devoted to Onions

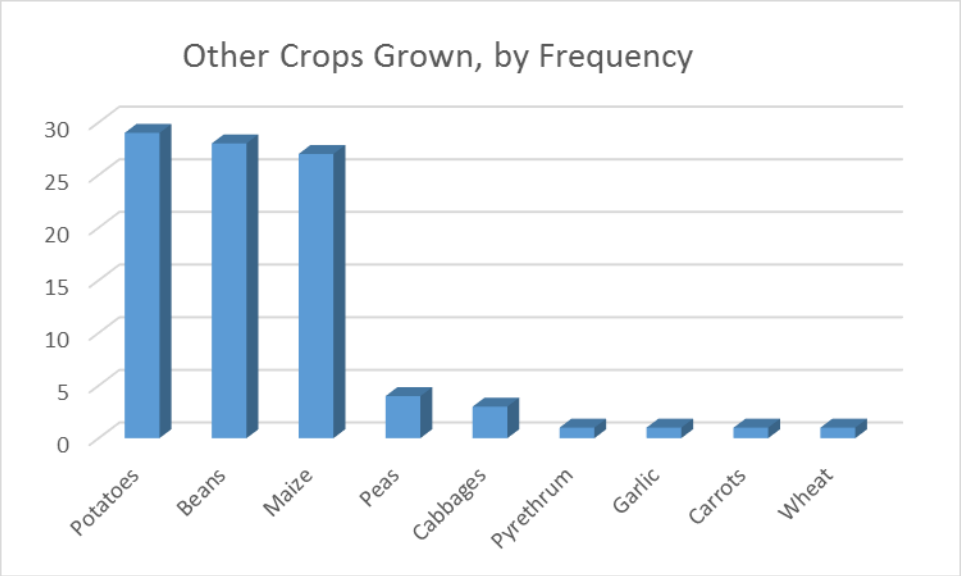


Figure 4: Other Crops Grown by Interviewed Farmers

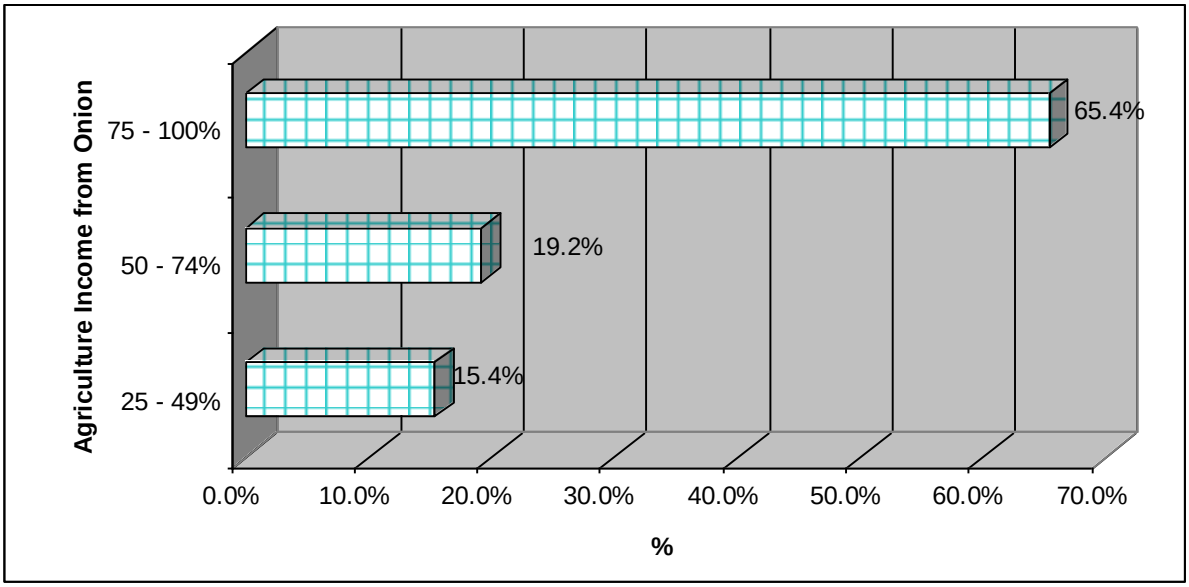


Figure 5: Percentage of Agricultural Income from Onions

5.3 Production and Harvesting

Onions are grown over several seasons annually (Figure 6) in the area. Farmers reported that they harvested, on average 5,514 kg of onions and 4,085 kg of other crops during the year. The distribution of

onion harvested by farmer is shown in Table 3. However not all production was transported out of the farms. For example only 65 % of farmers reported that 75% or more of their onion crop was transported to market (Figure 6). The amount that was not transported was consumed at home, or was lost in storage due to transport problems, or loss of quality during harvesting, storage and packaging.

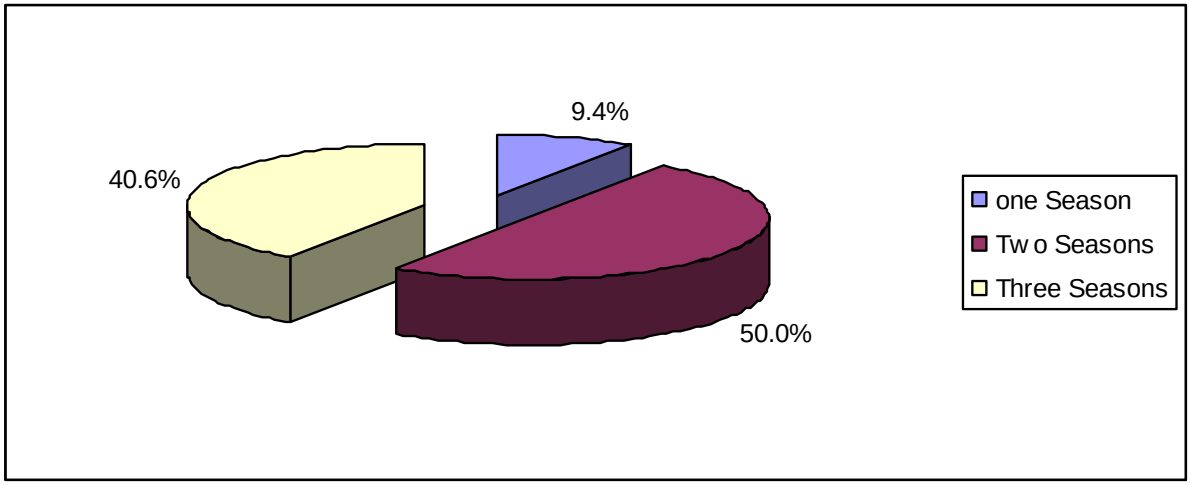


Figure 6: Onion Planting Seasons

Kilogrammes	**Frequency**	**Percent**
Less than 1000	1	2.9
1000-2,999	13	37.1
3000-4,999	4	11.4
5000-9,999	11	31.4
10000-19,999	5	14.3
20,000 and above	1	2.9
Total	**35**	**100.0**

Table 3: The Distribution of Onion Harvested by Farmer

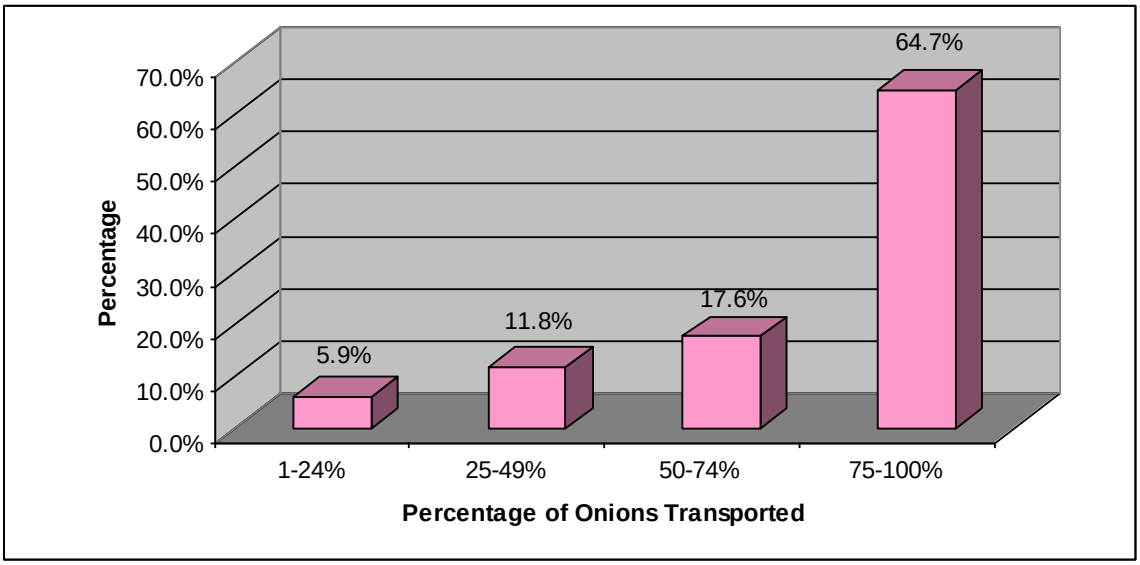


Figure 7: Percentage of Onions Transported.

5.4 The Transport Process to Market

The first mile distance (distance to the first collection point) is usually within 4 km (see Table 4). It was however noted that the farmers do not have common collection points where they deliver their produces but each take theirs to the nearest point on the accessible road. The modes of transport used to take produce to the collection point are given in Figure 8. Here it can be seen that for the first stage of movement back loading is the predominant form of transport, followed by animal carts. However some farmers (15 out of 35) are able to organize commercial transport straight from their farm to market, avoiding the first collection point.

Most transport is hired in, either in the form of boda bodas or in some cases, hired porters most of whom are women. The distribution of ownership is given in Figure 9. The journey time for the first stage of movement is given in Figure 10. The 'Difficult Time' estimate is during the wet periods when it is difficult to travel.

Collection Point Distance in Km	**Frequency**	**Percent**
Less than 1	7	29.1
1-1.9	7	29.1
2-3.9	6	25.0
4-9.9	1	4.2
10 and above	1	4.2
Not Applicable	2	8.4
Total	**24**	**100.0**

Table 4: Distance to First Onion Collection Point

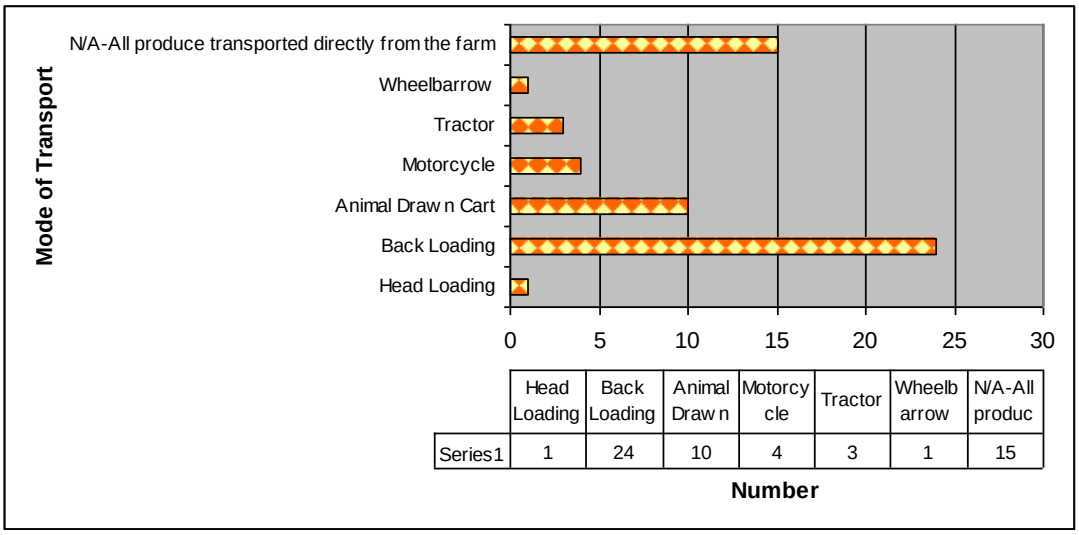


Figure 8: The Mode of Transport Used to Take Produce to the First Collection Point

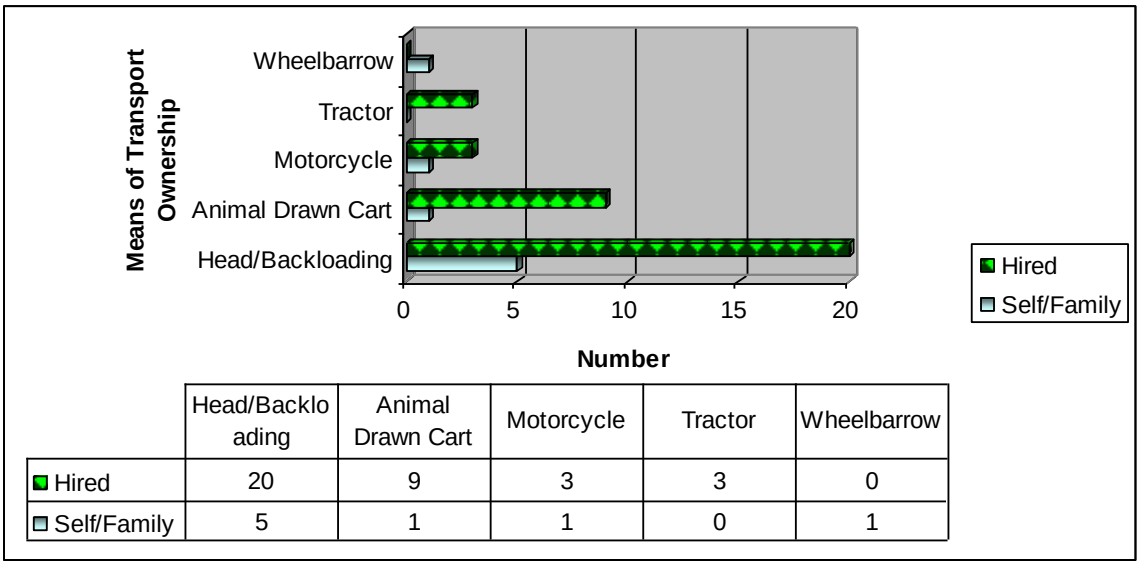


Figure 9: The Mode of Ownership of Transport to First Collection Point.

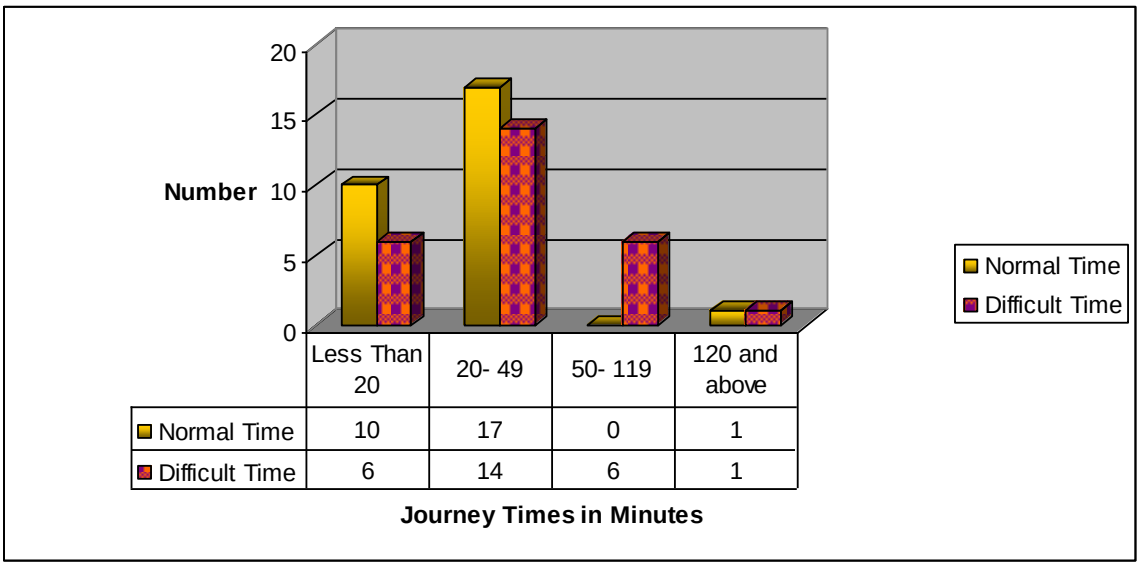


Figure 10: Journey Time from Farm to First Collection Point.

5.6 Charges, Distances and Loads for Different Modes

Table 5 provides a summary of average charges, distances and loads for different modes of transport covering the 'first mile'. In the absence of information on the lorry or pickup the motorcycle appears the cheapest on a per ton/km basis, while the tractor appears very expensive, however it is mostly used in the height of the wet season when other modes would have difficulty.

Mode	**No of farmers using mode**	**Average trip distance**	**Average load carried on a trip**	**Average cost per kg in Kshs**	**Average journey time – normal**	**Average journey time - difficult**
Back/Head loading/	25	2 Km	50kg	1.50	50 Mins	90 Mins
Lorry- Directly from farm	15	Destination Not Known	5,000kg			
Animal Drawn Cart	10	2 km	200kg	1.00	30 Mins	30 Mins
Motorcycle	4	8.25km	150kg	2.50	20 Mins	45 Mins
Tractor (used in wet season)	3	1km	2,000kg	5.00	25 Mins	30 Mins
Wheelbarrow	1	1km	100kg	2.50	30 Mins	60 Mins
Total	**58**					

Table 5: Average Charges, Distances and Loads for Different Modes

5.7 The Transport Operators and Modes Used

Of the 13 operators interviewed there was only one woman who provided back loading transport services. Table 6 gives their age distribution and Figure 11 the modes of transport used. From table 6 it can be seen that most of the transporters are young men aged below 40 years. Table 8 gives an indication of which

transport operators, by mode, have other professions. As can be seen just under half are also farmers in their own right.

Age in Years	Frequency	Percent
20-29	3	23.1
30-39	4	30.8
40-49	3	23.1
Total	10	76.9
No response	3	23.1
Total	13	100

Table 6: Transport Operators Age.

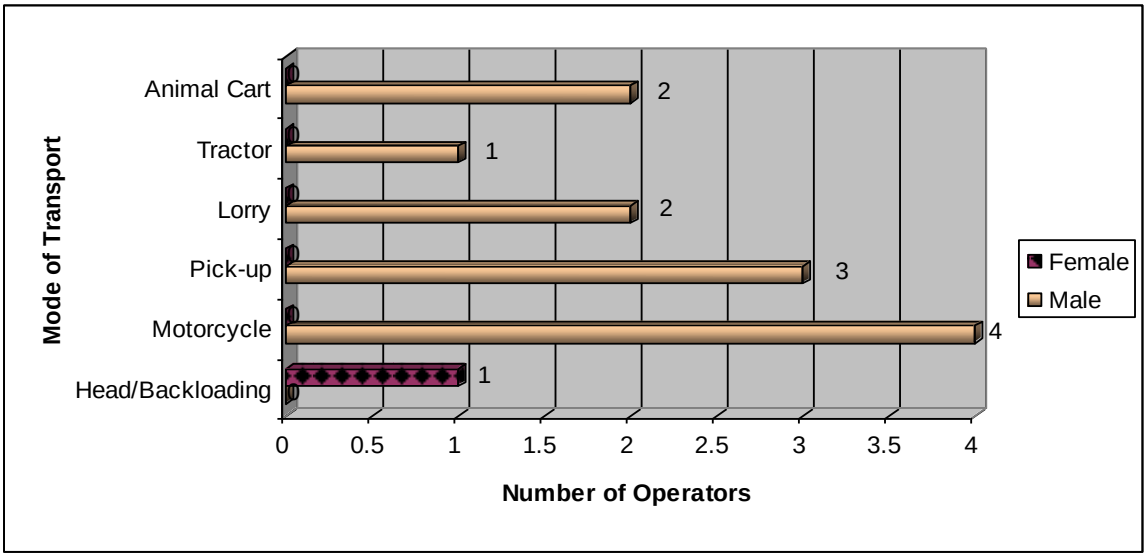


Figure 11: Modes of Transport Used.

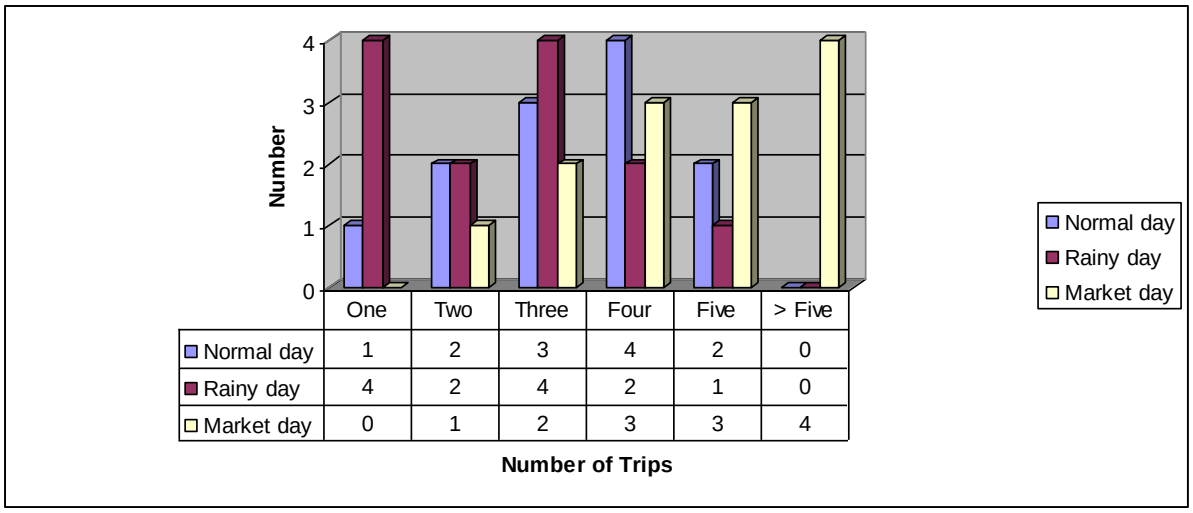
Service	Back/ loading	Motorcycle	Pickup	Lorry	Tractor	Animal Cart	Total
TS Operator only	**1**	**0**	**1**	**2**	**0**	**1**	**5**
Farmer/TS operator	**0**	**3**	**1**	**0**	**1**	**0**	**5**
Hired transport	**0**	**1**	**0**	**0**	**0**	**0**	**1**
Total	**1**	**4**	**2**	**2**	**1**	**1**	**11**

Table 7: Type of Operator

5.8 The Frequency of Trip Making

An indication of the number of trips made per day is given in Figure 12. It can be seen that market days are the busiest with four operators reporting more than five trips per day. Less trips are made on normal days and even less on rainy days. There is some difference in the perception of the number of 'busy days' per year. The mode is around 100 days per year. This is shown in Table 9. Questions were asked to see whether it was felt that the number of vehicles, and the number of trips had increased or decreased over

the past year. This data is shown in figures 13 and 14. On balance it appears that there has been a slight decrease in transport activity compared with last year.



	One	Two	Three	Four	Five	> Five
Normal day	1	2	3	4	2	0
Rainy day	4	2	4	2	1	0
Market day	0	1	2	3	3	4

Figure 12: The Number of Trips Made Per Day

Days	Frequency	Percent
30-69 days	2	15.47
70-109 days	6	46.2
110-149 days	2	15.4
150 and above days	1	7.7
Total	12	92.3
No response/not applicable	2	15.4
Total	13	100

Table 8: The Number of 'Busy Days' per Year

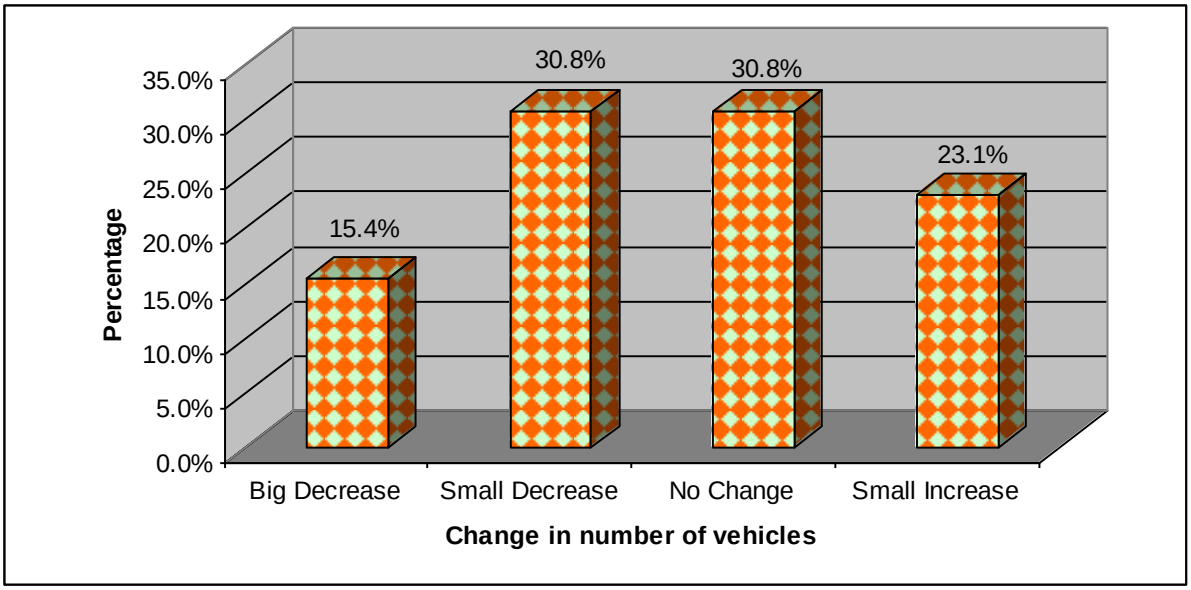


Figure 13: Perceived Change in the Number of Vehicles Compared with Last Year.

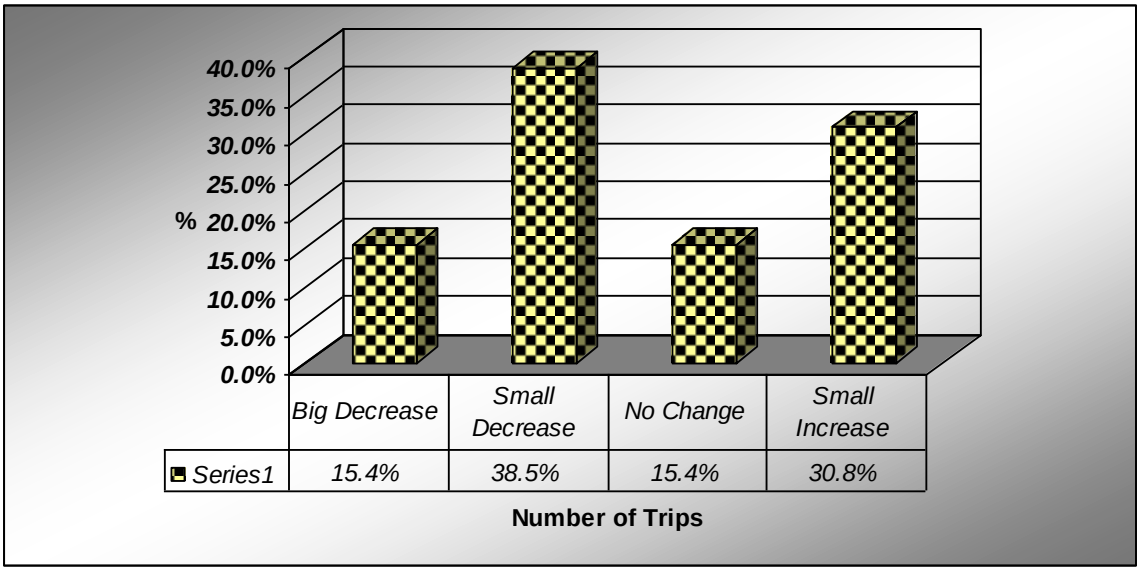


Figure 14: Perceived Change in the Number of Trips Compared with Last Year.

5.9 Charges, Distances and Loads Carried

As one may expect from the farmer's data most of the reported loads carried are small and the distances relatively short. Table 9 provides data from transporters on typical loads on a normal day, while Table 10 gives data on charges. Information on average loads, distances and changes are given in Table 11. The transporters reported that they transport both accompanied and unaccompanied loads. As expected it can be seen that lorry transport is by far the cheapest on a ton/km basis, in contrast short distance movement by tractor was over 30 times more expensive, while back loading and motor cycle transport were over 16 times more expensive.

Amount in Kgs	Frequency	Percent
Less than 200	5	46.2
200- 999	2	15.4
1,000-1,999	2	15.4
2,000-3,999	1	7.7
4,000-5,999	1	7.7
6,000 and above	1	7.7
Total	13	100

Table 9: Onion Loads Carried by commercial/for hire Transporters on a 'Normal Day'

Amount in Kshs	Frequency	Percent
Less than 500	6	46.2
500-999	1	7.7
1,000-2,999	2	15.4
3,000-4,999	1	7.7
5,000 and above	3	23.1
Total	13	100

Table 10: Amount Charged in Kenya Shillings for loads on a 'Normal Day'

Mode	No of transporters	Average trip distance in Km	Average total load in Kg	Average charge Ksh per kg	Average charge Ksh/ton-km
Motorcycle	4	10	150	5	500
Pick up	3	10	1,800	0.9	90
Lorry	2	30	8,000	0.9	30
Animal Cart	3	2	350	1.75	875
Head/back loading	1	2	40	1.0	500
Tractor	1	2	4,000	2.0	1000

Table 11: Average Distances, Loads and Charges, by Different Modes

5.10 Traffic Count Survey Results

Traffic surveys were undertaken on two roads, (Kiawara to Belevue, and Kabendera to Kimunyuru) from 6am to 6 pm on Saturday, 3rd May, 2014. The modal composition is given in Table 12. It is shown that motorcycles constitute the dominant mode of transport with over 60 % of the recorded traffic. It is interesting to note how limited bicycle traffic is, this may relate to the steep terrain. Apart from motorcycles, most of traffic categories mentioned by the farmers and transporters (i.e. back loading, animal carts, tractors, wheel barrows and motor cycles) for the first mile transport to the first pick up point were not so common. This perhaps indicates that some load consolidation had already taken place, before reaching the road. An examination of the detailed data (recorded in quarter of an hour intervals) shows that traffic was fairly evenly balance throughout the 12 hours for both roads.

Mode	To Kiawara	From Kiawara	To Kimunyyuru	From Kimunyuru
Head/Back loading	0	0	11	0
Handcarts	1	2	0	0
Animal drawn	2	0	7	6
Bicycles	2	6	0	0
Motorcycles	176	181	105	117
Small cars	53	45	10	17
Matatus	38	35	3	9
Buses	1	1	0	0
Pickups/Vans	20	15	12	13
Lorry	17	14	4	6
Large Truck	2	0	0	0
Tractor	1	0	1	1
Total	313	299	153	169

Table 12: Traffic Survey Modal Composition

6.0 OVERALL CONCLUSIONS

The main purpose of this pilot survey was to collect background information on First Mile agricultural transport and provide an opportunity to test out survey procedures and survey instruments. Although the survey has been limited in scope, for example with only 35 farmer interviews and 13 transporter interviews, useful data has been collected and lessons learned on the strengths and weaknesses of the approach. Overall it has been found that the costs of onion transport over the first two kilometres probably accounts for around 10% to 20% of the net income that farmers would derive from their sale and production. At the same time it has been found that the conventional methods of transport used (eg backloading, animal transport, motorcycle transport) costs 16 to 30 times more than lorry and truck transport costs, on a per ton/km basis. Hence there are potentially huge benefits to be gained by improving First Mile transport, through better infrastructure and load consolidation.

Overall the study indicates that the topic is well worth investigating further though larger scale surveys, in different terrains and climatic regions.

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APPEDICES

APPENDIX 1: FARMERS GROUP FOCUS GROUP DISCUSSION (FGD) GUIDE

Background information on participants

Name of the Farmers Group:_____
Size of the Group: _____
Year of Group formation: _____
Group's membership size: _____
Group's geographic scope of operation: _____
Group's contact person: _____
Position of the contact person: _____
Telephone/Contact of the Group: _____
Venue of the FGD:_____
Date: _____
Moderator(s) Name(s):_____

For each participant of the FGD, please take down the following information in a register/Note book

1. Name
2. Age
3. How long member of farmers group
4. Ever grown Onions [Yes or No]
5. If growing Onions, for how long?
6. Whether official/ordinary member

Instructions: This FGD will be conducted with 6 to 12 participants who are members of a farmers group targeted for the First Mile Transport Challenges Study.

Introduction: Thank you for the opportunity to speak with you. We are a research team interested in learning more about agriculture in this area. We assure you that all the information that you provide to us will be used exclusively for our research and analysis. We will record the session but all responses will appear anonymously. This is not a test, and there are no right or wrong answers. The most important thing is that you should feel comfortable and contribute. You can express opinions and discuss issues freely but respecting other members' opinions.

Objective: This session brings together members of farmers group in the area to talk about their ideas, perspectives and opinions about onions transportation from the farm to collection point. This is well suited to assessing experience farmers have with onion transportation by allowing the research team better understand onion transportation practices, while also learning the important role the farming groups play in addressing framers transportation needs including ideas for future improvements.

Discussion Questions

1. What is the objective of this group? Probe whether farm products transportation and more so onion transportation has been factored in
2. In this farmers group, why are members decided to farm onions?

3. Percentage of cash income from other crops grown in the area?
4. Do you keep records for group members' onion produce in terms of volume? Probe for the nature of records and volume over the last three years.
5. Are there people in your farmers group who have stopped farming onions? If yes, why did they stop growing onions? To check for the profitability and popularity of onions as compared to other crops and probe for transportation cost at first mile as a possible hindrance.
6. What is percentage of cash income from onions?
7. Are onions transported together with other crops?
8. How do members transport their onions from first mile to collection point? Probe for modes used and their suitability?
9. Do they go to the same destination(s)?
10. What urgency is there in selling onions once it has been harvested?
- Is indebtedness a problem- so need quick sale?
- Is there an immediate need for cash e.g. school fees?
- Does the state of the road affects when sales take place? If so why?
- Do you store onions? If so how? Do you do this to fetch better prices in the market?

11. Do men or women use particular modes which are different?
12. Is the group facilitating members in transportation of onions at the first mile? If Yes, how and if no, why?
13. From your experience, do members of this farmer's group make their decision about continuing to grow onions based on what other members of the farmers group do or do they make their decision independent of others? [*Probe to find out why*].
14. How and where do you market onions? What means of transport do you use to reach your target market? At what cost? Who bear the cost of transportation? What percentage of your revenue is transportation cost taking?
15. Is there a difference in onion transportation in the last one year? (Trying to compare the devolved government and centralized government) probe for the difference in terms of any new payments made or scrapped payments.
16. Which other institution/agency do you partner with in ensuring that onion farmers benefit from the products?
17. What role is the group planning to play in ensuring efficient transportation of onions in the area?

13. How can onion transportation in the area improved? Who should play a leading role in this?

APPENDIX 2: KEY INFORMANT GUIDE-TRANSPORT/INFRASTRUCTURE EXPERT

Questions	Coding categories Code
SECTION 1:RESPONDENT'S BACKGROUND	
Name of Enumerator	**Tel. No.**
1. Name of the respondent	**Tel. No.**
1a. District Name	
2. Ministry/Institution	
3. Department/Section:	
4. Position of the Respondent	
5. Gender	**1. Male 2. Female**
6. Respondent Contacts	
7. Respondents Education Level	
8. Age in Years	
SECTION 2: AGRICULTURAL ACTIVITIES	
9. What is the role of your institution/organization in as far road/transportation in the area is concerned?	
10. Do you have any working relationship with small scale farmers? Discuss nature of the relationship briefly?	

11. How would you describe the current status of roads as compared to 2 years ago? Probe for feeder roads?	
12.What issues/challenges do you face in provision of roads leading to small scale farms? Which part of the area is worst hit in terms of poor roads and why?	
13. How are you addressing the challenges discussed above?	
14. Do you have any records or statistics on roads construction/rehabilitation/management in the area? Is it possible to get for the last three years	
SECTION 3: TRANSPORTATION AND MARKETING	
15. What is the infrastructure like? Are smallholders' farms and villages accessible by roads?	
16. Would you consider their choice of Collection Point appropriate for their type of crop? Why? And where would you suggest and Why?	
17. What is the popular mode of transport do they use to transport their produce directly from the farm? Why?	
18. Do you have any record(s) on transportation costs of onions in the area (From farm to Collection Point) (From Collection Point to other popular market)?	
19. Which area(s) would you consider as most challenging in terms of transporting farm produce by the small scale farmers?	
20. What kind of roads/transportation improvement is needed in this area? Who should be the key actors to drive the improvement agenda Why?	

21. How can small scale farmers assisted to transport their produce directly from their farms at minimal costs? What need to be done to enable them adopt the proposed transportation mode?	
SECTION4: REGULATORY FRAMEWORK	
22. Would you say that, all necessary transport/road infrastructure regulations are in place to facilitate small scale onion farmers' requirements? Discuss	1. Yes ☐ 2. No ☐
23. Which transport/road infrastructure regulations need to be put in place to support small scale farmers transport their produce economically? Who should play a role in this and why?	
24. Are there any change(s) in regulations targeting transportation of farm produce/rural roads since the introduction of devolved government in the area?	1. Yes ☐ 2. No ☐
25. How have they changed the way small scale farmers operate?	

26a. Give details of the roads, links having the worst problem in the area

Road Name	Location	Length in Kms	Which months are these roads difficult but possible to travel on	Which months are these roads effectively closed to motorised traffic such as trucks

b. How many days in the months mentioned are the roads most difficult but possible to travel on?
_____

b. How many days in the months mentioned are the roads most effectively closed to traffic such as trucks? _____

Close: Thank you very much for your time. Your Knowledge and Insights will be very helpful to our study in understanding the complexity of transportation burden shouldered by small scale farmers in the region.

NB: Will appreciate If I can get any relevant data on road construction and related facilities construction over time and associated costs over time- a maximum of three years, to enable us appreciate the effort made by your organization/institution in reducing transportation burden borne by the small scale farmers.

APPENDIX 3: KEY INFORMANT GUIDE-AGRICULTURE EXPERT

Questions	**Coding categories** **Code**
SECTION 1:RESPONDENT'S BACKGROUND	
Name of Enumerator	**Tel. No.**
1. Name of the respondent	**Tel. No.**
1a. District Name	
2. Ministry/Institution	
3. Department/Section:	
4. Position of the Respondent	
5. Gender	**1. Male 2. Female**
6. Respondent Contacts	
7. Respondents Education Level	

8. Age in Years	
SECTION 2: AGRICULTURAL ACTIVITIES	
9. What is the role of your institution/organization?	
10. Do you work with small scale farmers? How?	
11. How would you describe the current status of agriculture as compared to 2 years ago? Probe for small scale farmers?	
12.What issues/challenges are small scale farmers such as onion farmers face? Which crops is worst hit and why?	
13. Do you/any other organization support/assist farmers in transportation of their farm produce? If Yes, how and which other organizations do support transportation of farm produce?	
14. What are the conditions given to farmers to benefit from transportation logistic? If costed, how is it costed and at how much?	
15a. Is there any shift to any particular crop in the area? If Yes, which crop is attracting small scale farmers and which one is loosing out?	
15b. What is the reason for shifting crops?	
16. Do you have any records or statistics on onion production in the area? Is it possible to get for the last three years	
17. Do small scale farmers have farmers groups? If Yes, which ones would you consider active?	
18. What issues do you think have mobilized small scale farmers to form farmers groups?	
SECTION 3: TRANSPORTATION AND MARKETING	

19a. Where do onion farmers in this area take their produce to directly from their farms? Why?	
19b. What is the infrastructure like? Are smallholders' farms and villages accessible by roads?	
20. What market information do small scale farmers in this area require?	
21. Would you consider their choice of Collection Point appropriate for their type of crop? Why? And where would you suggest and Why?	
22. What is the popular mode of transport do they use to transport their produce directly from the farm? Why? Do they do it individually or as a group and why?	
23. Do you have any record(s) on transportation costs of onions in the area (From farm to Collection Point) (From Collection Point to other popular market)?	
24. Which area(s) would you consider as most challenging to the small scale onion farmers?	
25. What kind of improvement is needed in this area? Who should be the key actors to drive the improvement agenda and why?	
26. How can small scale farmers assisted to transport their produce directly from their farms at minimal costs? What need to be done to enable them adopt the proposed transportation mode?	
SECTION4: REGULATORY FRAMEWORK	
27. Would you say that, all necessary regulations are in place to facilitate small scale onion farmers' requirements? Discuss	1. Yes ☐ 2. No ☐

28. Which regulations need to be put in place to support small scale farmers transport their produce economically? Who should play a role in this and why?	
29. Are there any change(s) in regulations targeting small scale farmers since the introduction of devolved government in the area?	1. Yes ☐ 2. No ☐
30. How have they changed the way small scale farmers operate?	

31. Onion price over the year in Kshs per Kg.

Crop	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Onion												

Close: Thank you very much for your time. Your Knowledge and Insights will be very helpful to our study in understanding the complexity of transportation burden shouldered by small scale farmers in the region.

APPENDIX 4: TRANSPORT OPERATOR PERSPECTIVE QUESTIONNAIRE

Objective: This instrument aims at documenting the dynamics of onion transport cost in the area by covering all the existing modes of onion transportation aspects existing in the area. This important in analyzing the cost of transporting Kilogram of onion/Km for different modes which help in understanding the transportation burden farmers undergo in the First Mile Phase of Transportation.

Collection Point Name:_____ Date of Interview:_____ Interviewer :_____

Farm Origin Location Name: _____

Average Trip Distance in KM (From the Farm to Collection Point): _____

Day of the Interview: 1. Normal day 2. Market Day 3. Weekend 4. Rainy day

Geo. Coordinates: _____ *(optional, if GPS available)*

Name of Transporter:_____ Gender: Female Male Age: _____

Onion Transport Service (TS) Owner: 1. TS operator 2. RTS owner-operator 3. Self (Farmer) 4. Hired*(circle one)*

TRANSPORT MODE: _____ (one form for each transport mode discussed)

Options are: Head/Back Loading/Matatus / (Saloon/estate, Pickup / Lorry / Motor tricycle / Motorcycle /T tractor / Bicycle / Animal cart / Other (specify)

Other information (optional) _____

N.B. Only one row per table should be completed: that of the transport mode of the respondent

O1-1. How many onion transportation trip(s) do you make on this section of the road on normal days, busy days and rainy days using your mode of transport?

Reference number	O1-1a	O1-1b	O1-1c	O1-1d
	Normal day	Rainy day	Busy day (eg market day)	Number of busy days a year *(eg, weekly = 52)*
Head Loading/Backloading				
Bicycle				
Motorcycle				
Tri-Cycle				
Pick-up				
Matatu				
Lorry				
Tractor				
Other (Specify)				

O1-2. How much onion do you carry per trip in Kilogram's on this section of the road on normal days, busy days and disrupted days?

Reference number	O1-2a	O1-2b	O1-2c
	Amount of Onions Carried per trip (Kgs) Normal day	Amount of Onions Carried per trip (Kgs) Rainy day	Amount of Onions Carried per trip (Kgs) Market day
Head/Backloading			
Bicycle			
Motorcycle			

Tri-Cycle			
Pick-up			
Matatu			
Lorry			
Tractor			
Other (Specify)			

O1-3. How much do you charge in Kshs per trip on this section of the road on normal days, busy days and disrupted days?

Reference number	O1-3a	O1-3b	O1-3c
	Amount Charged in Kshs per trip Normal day	Amount Charged in Kshs per trip Rainy day	Amount Charged in Kshs per trip Market day
Head Loading/Backloading			
Bicycle			
Motorcycle			
Tri-Cycle			
Pick-up			
Matatu			
Lorry			
Tractor			
Other (Specify)			

O1-4. What are the periodic/seasonal fluctuations in Reliability of Onion Transport services?

Reference number	O1-4a	O1-4b	O1-4c	O1-2d
	Estimate Number of Days with no service per year [1]	Number of Days with disrupted service per year [1]	Number of months with good Transport Services per year [1]	Total
Head Loading/Backloading				= 365
Bicycle				=365
Motorcycle				= 365
Tri-Cycle				= 365
Pick-up				= 365
Matatu				= 365
Lorry				= 365
Tractor				= 365
Other (Specify)				= 365

[1] *Note: Decimals are allowed for number of month per year.*

Note: we are trying to capture the number of actually disrupted days and not the length of the rainy season(s).

O1-5. During the past year, has the number of vehicles operating each day along the road changed?

(for your mode of transport).

Big decrease	Small decrease	No change	Small increase	Big increase

O1-6. During the past year, has the number of trips per day for your type of vehicle transporting onions along your regular route changed?

Big decrease	Small decrease	No change	Small increase	Big increase

O1-7. What is the overall condition of the road infrastructure in relation to your mode of transport?

Very poor or non-	Poor or	Medium	Good for RTS	Very good for

motorable	non-motorable part of year			RTS

O1-8. Are there any active associations (formal/informal) of operators for your mode of transport on this road?

No association	Association with member welfare	Association concerned with welfare + fares control	Association concerned with welfare + fares control, queuing and terminal	Association with welfare + fare control, queuing, terminal + route allocation

O1-9. How many vehicles are sharing the Onion transport market leading to this Collection Point?

	Number of vehicles	Number of owners / franchise	Number of associations	Number of vehicles operating outside association context
Head Loading/Backloading				
Bicycle				
Motorcycle				
Tri-Cycle				
Pick-up				
Matatu				
Lorry				
Tractor				
Other (Specify)				

O1-10. Do you transport farmers with accompanied onion produces?

If so how much do you charge for accompanied produce? _____

For what distance does that price refer? _____

Type of vehicle this information refers to _____

O1-11. Do you transport unaccompanied onion produce for farmers?

If so, what is the maximum onion produce can you transport unaccompanied in Kgs? _____

If so how much do you charge for such unaccompanied produce? _____

For what distance does that price refer? _____

Type of vehicle this information refers to. _____

1-12. Crops Transportation Dynamics

Crops	**Months**													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	**Total**	
Percentage of Onions Transported														
Percentage of Other Crops Transported														

Total														

O1-13. Destination and Distance

Crops	**Months**												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Comment on Distance
Destination of Onions Transported													
Destination of Other Crops Transported													

APPENDIX 5: FARMERS QUESTIONAIARE

RESPONDENT FIRST MILE STUDY

1a. Study area Division: _____ b. Location: _____c. Sub/Location: _____d. Village: _____e. GPS Coordinate: _____

2a. Number of Onion Planting Seasons: _____b. Number of Months Transporting Onions in a year: _____

3a. Interviewee's name: _____3b. Date of Interview: _____ 3c. Time: _____

U1-1. Please provide the required information below for Farmer's Socio-economic Data and General Onion Production Dynamics			
A).Name of Farmer or Farming Group:	C: Farmers Gender: 1. Male 2. Female For groups: No. of Male:_____ No. of Female: _____	E: Estimated Size of farm under onion in acres:	G: Nature of Onion Farming: 1. Individual 2. Group 3. Other Specify _____
B). Farmers Age:	D: Farmers Education Level: 1. No Formal Education 2. Primary Education 3. Secondary Education	F: Land under onion Ownership Status: 1. Freehold 2. Leasehold 3. Rented	H: Onion Produce Transportation: 1. Individual 2. Group

		4. Tertiary		4. Other Specify _____			3. SACCO 4. Other Specify _____
A. List of Crops grown and Harvested	B. Percentage of Onion Crop Harvested	C. Percentage of Onion Crop Transported	D. Percentage of Agriculture Income provided by Onion Crop	E. Total Kgs harvested for Onions	F. Total kgs harvested for other Crops	G. Percentage of Amount Used for fertilizer/Pesticide for Onions	H. Percentage of Amount Used for fertilizer/Pesticide for all Crops
I. Percentage of Amount Used for Labour	J. Average Cost of Production Per Acre Per Season in Kshs.	K. Average revenue per acre per season in Kshs	L. Costs of transporting per trip by mode listed	M. Popular Onion Delivery Point in the area	N. Distance in Km to the popular Collection Point	O. Gender of regular onion transporter to the Collection point 1. Male 2. Female	P. Ownership of Regular Means of Transport used to Transport Onions: 1. Owned 2. Hired 3. Other Specify:

U1-3. Please provide the required information below for each mode of transport used for transporting Onions to the Collection Point

(Please record at least 2 different means used by farmers if possible)

Means of Transport Used	*Means of Transport Ownership* 1. *Self/Family* 2. *Hired*	*Farm Location*	*Collection/Delivery Point Location*	*Dist. (km)* Note 1	*Trip Frequency Per day*	*Trip Frequency Per week*	*Journey time (min)*		*Accompanied freight*		*Accompanied freight*	
							Normal period	*Difficult period*	Weight in *kg* Note2	Cost	*Weight kg*	*Cost*
Head Loading												
Back Loading												
Handcart												
Animal Drawn Cart												
Bicycle												
Motor												

cycle												
Pick- up												
Matatu												
Others Specify												

1. Actual distances can be calculated from origin and destination, so leave blank if unsure of accuracy of information .
2. Where cost is per container (eg basket of produce) estimate a typical weight of this

U1-4a. What is the typical total onion consignment size transported in one go from your farm in Kgs?_____

U1-4b. How much does it cost to transport such consignment to Collection Point in Kshs? _____
Distance in Km _____

APPENDIX 6: STUDY TRAFFIC COUNT SHEET

Objective: To estimate the volume and variety of traffic between farms and collection points

Name of Surveyor: _____ Tel. Contact: _____Date: _____

Day: 1. Normal Weekday 2. Busy/Market Day 3. Weekend 4. Other (Specify) _____

Physical Location of the Cordon Point: _____ Geo Coordinates: _____

Distance of Cordon Point Location from the Collection Point/Hub in Km: _____

Name of the Road: _____

Direction of Travel: _____

		Means of Transport												
Travel Direction	**Time**	**Head/Back Loading**	**Handcarts**	**Animal Drawn Carts**	**Bicycle**	**Motorcycles**	**Small Cars**	**Matatus**	**Buses**	**Pick-ups& Vans**	**Lorry**	**Large Truck**	**Tractor**	**TOTAL**
	6.00-6.15 am													

	6.15-6.30 am													
	6.30-6.45 am													
	6.45-7.00 am													
	7.00-7.15 am													
	7.15-7.30 am													
	7.30-7.45 am													
	7.45-8.00 am													
	8.00-8.15 am													
	8.15-8.30 am													
	8.30-8.45 am													
	8.45-9.00 am													
	9.00-9.15													

	am													
	9.15-9.30 am													
	9.30-9.45 am													
	9.45-10.00 am													
	10.00-10.15 am													
	10.15-10.30 am													
	10.30-10.45 am													
	10.45-11.00 pm													
	11.00-11.15 pm													
	11.15-11.30 pm													
	11.30-11.45 pm													
	11.45-12.00 pm													

	12.00-12.15 pm													
	12.15-12.30 pm													
	12.30-12.45 pm													
	12.45-1.00 pm													
	1.00-1.15 pm													
	1.15-1.30 pm													
	1.30-1.45 pm													
	1.45-1.00 pm													
	2.00-2.15 pm													
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	pm													
	3.00-3.15 pm													
	3.15-3.30 pm													
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	3.45-4.00 pm													
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	4.45-5.00 pm													
	5.00-5.15 pm													
	5.15-5.30 pm													
	5.30-5.45 pm													

	5.45-6.00 pm													
	TOTAL													

CROWN AGENTS