Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

Analyzing the delivery of public agricultural extension services to rural households during Covid-19: A case study of Idutywa, Eastern Cape, South Africa

Mzuyanda, C.[1], Luvhengo, U.[2], Jiba, P.[3], Khobai, H.[4] and Letsoalo, S.S.[5]

Corresponding Author: C. Mzuyanda. Email: mzuyanda1990@gmail.com

ABSTRACT

This study analysed the delivery of public agricultural extension services to the rural households of Idutywa, Eastern Cape. Primary data were collected from 75 participants. Descriptive and inferential statistics were used to analyse the data. Results revealed that there is generally a lack of access to extension services by households in the study area. Above all, the findings showed that access to agricultural extension services is influenced by limited movements, cellphone data, household size, and a limited number of farmers for training. Based on the control and treated variables, the Average Treatment Effect Treated from Kernel, Nearest Neighbours, and Radius matching methods were found to be negative which means that if farmers did not receive the program during the pandemic, the performance and yields were going to be very poor and low. The study recommends that extension officers should be empowered with modern tools to deliver need-based agricultural extension services in the future.

Keywords: Households, Covid-19, Access to Public Extension Services, Logit model

[1] Lecturer. Department of Agricultural Economics and Extension, North-West University, Private Bag X2046, Mmabatho 2735, South Africa. Email: mzuyanda1990@gmail.com

[2] Lecturer. Department of Agricultural Economics and Extension, North-West University, Private Bag X2046, Mmabatho 2735, South Africa. Email: luvhengousapfa@gmail.com

[3] Department of Agricultural Economics and Extension, North-West University, Private Bag X2046, Mmabatho 2735, South Africa. Email: phiwejiba@gmail.com

[4] Senior Lecturer. Department of Economic, North-West University, Private Bag X2046, Mmabatho 2735, South Africa. Email: hlalefangk@gmail.com

[5] Professor. Department of Agricultural Economics and Extension, North-West University, Private Bag X2046, Mmabatho 2735, South Africa. Email: simon.letsoalo@nwu.ac.za

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

1. INTRODUCTION

The purpose of this study is to analyse the delivery of public extension services during covid-19 among rural households in the Eastern Cape. The paper consists of background, statement of the problem, objectives of the study, theoretical and conceptual framework, research methodology, results and discussion, conclusion, and recommendations**.**

1.1 Background of the study

Flu-related outbreaks continue to be a threat to economies and public health all over the world (Jones et al., 2008). Evidence suggests that there have been 6 flu-related pandemics in the past 120 years (1889, 1918, 1957, 1968, 2009, and 2020). Before the 2020 outbreak, the "Spanish flu" was regarded as the most severe outbreak which occurred from 1918 to 1919 and led to about one million deaths. Most recently, May 2009 saw the emergence from Mexico of the H1N1 (commonly known as swine flu) virus capable of human-to-human transmission. Highly transmissible, yet ultimately mild, it rapidly spread around the world, infecting 74 different countries on all six continents within five weeks. The rate of spread of the pandemic was far more rapid than previously observed, enabled by high volumes of international air traffic (Verikios et al., 2011). In January 2020, the World Health Organization (WHO, 2020) declared the coronavirus (COVID-19) the worst outbreak that the world has ever experienced. SARS-Cov-2 (the virus that causes COVID-19) is the latest member of the coronavirus family to affect humans. This type of virus is mainly found in humans and other mammals such as pangolins.

In humans, the clinical symptom of this virus includes the common cold. Since this virus is a new challenge to humans, there is no pre-existing immunity in humans and as such, everyone is susceptible to it. According to the National Institute of Communicable Disease (NICD) (2020), the elderly and people of any age who have an underlying medical condition are more vulnerable to coronavirus. Coronavirus is transmitted via droplets and fomites (contact with contaminated surfaces). The first case of COVID-19 was firstly reported in December 2019 in Wuhan, China (WHO, 2020). Since then, the virus has been spreading very fast across the globe, affecting 210 countries, and claiming close to 500 000 lives as of May 2020 (WHO, 2020). Because of the absence of specific vaccines for COVID-19, many countries such as South Africa have chosen "lockdown" as a strategy to slow down the spread and protect their populations. This approach aims to reverse epidemic growth, reducing case numbers to low

10.17159/2413-3221/2022/v50n1a14403

levels by socially distancing the entire population, closing schools and universities, and halting all non-essential economic activities (NICD, 2020).

1.2 Problem statement

During the lockdown, people were urged to stay at home and to go out only to meet the most urgent needs like buying food (SA government, 2020). As much as this was a necessary and legal step to contain the spread of the virus, the reality is that it impacted the food supply chain (UN, 2020), access to markets, and agricultural extension services (Muvhuringi, 2021). In his first address on Covid-19, President Ramaphosa (2020) indicated that agriculture will be part of the essential services. However, the prohibition of public gathering meant that the provision of agricultural extension services such as farmer training, agricultural input distribution, field visits, field schools, and district agricultural shows would not be feasible. This was very unfortunate for rural households as farmer training and agriculture extension services are critical in improving the quality and quantity of agricultural products. This study analyses the extent to which the delivery of extension services impacted rural households in the Eastern Cape. In doing so, the findings of this study will not only assist policymakers in formulating effective policies but also can provide insights into the preparation efforts for similar infectious diseases in the future. To date, no study has empirically analyzed the delivery of extension services during CVID-19 and its impacts on rural households in Eastern Cape.

2. LITERATURE REVIEW

2.1 Conceptual framework

The study has investigated the determinants of public extension services delivery. Figure 2 illustrates the conceptual framework of this study. According to the literature, different factors determine access to extension services by rural households. These factors are broadly categorised into demographic, socio-economic, and institutional.

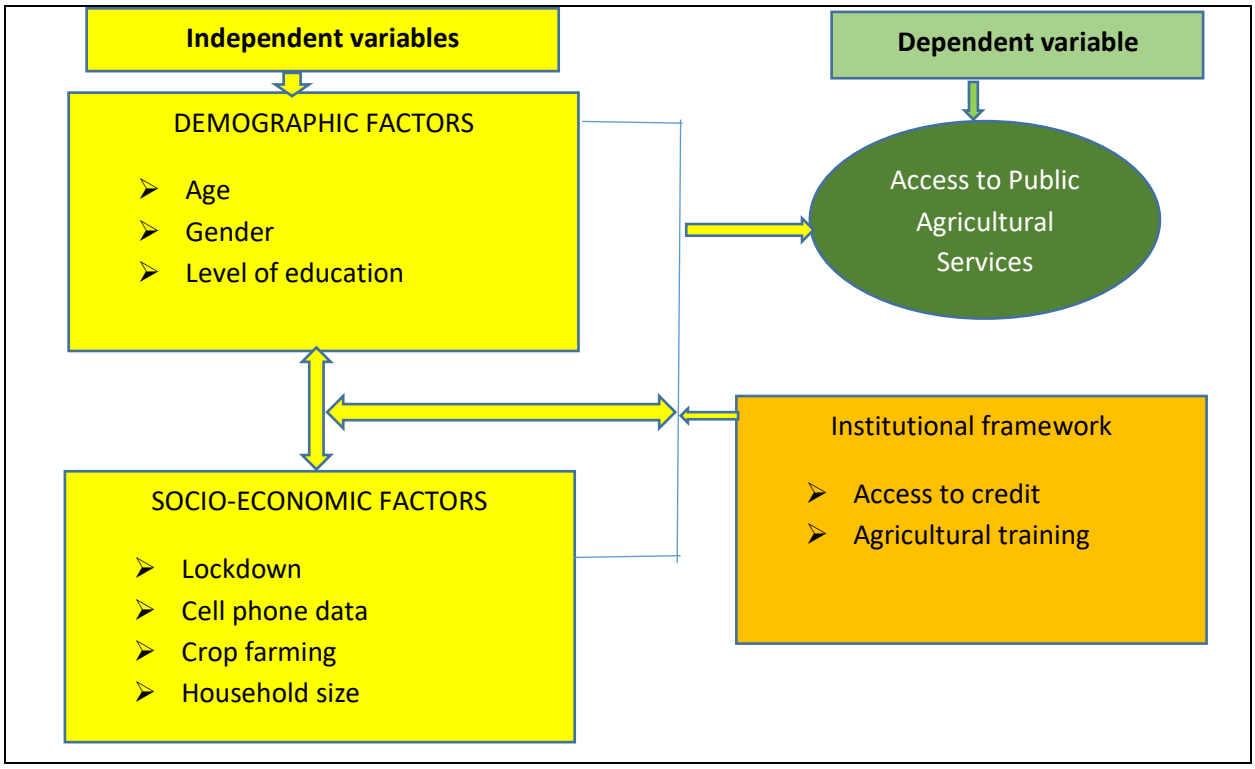

Figure 1: Framework showing determinants on access to extension services

2.2 Agricultural extension in South Africa

In South Africa, just like in other developing countries, the state provides all extension support services to smallholder farmers. These services are offered free of charge as social welfare, which makes government bear all the costs (Koch and Terblanché, 2013). However, the recent economic plunge, coupled with bureaucratic inefficiencies in the agricultural sector, has led to the government reducing its investment in extension provision services. According to Afful and Lategan (2014), the limited funding for extension services has aggravated the administration of the sector, leading to poor service delivery amongst smallholder farmers who rely on the government for extension services. Furthermore, funding is at the centre of several institutional challenges currently facing the administration of extension services. These include the low extension worker to farmer ratio, which stands at 1:1500, the laying off of skilled and experienced workers, poor essential support, like transport, and the inadequate supply of inputs and information (Hlatshwayo and Worth, 2016; and Nkosi, 2017).

The challenges mentioned above, coupled with poorly formulated extension policies, rigid approaches, and a lack of monitoring and evaluation by the State, have in one way or another, contributed to the poor performance of the sector (Williams *et al.*, 2008; Maoba, 2016).

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

Evidence of this poor performance can be seen in the low output of smallholder farmers, who largely depend on government-supplied extension services (Sikwela, 2013), and this has led to many criticisms of the government-led extension service (see, for example, Hall and Kepe, 2017). The background of agricultural and advisory services is different from any other African country. Its foundation and premise are a result of both colonialism and the apartheid era. This study explored the background narratives of three authors depicting different events of the origin and maker of extension in South Africa. Similarly, to the agricultural sector, the early history of agricultural extension services in South Africa is twofold. Liebenberg (2015) in a discussion paper entitled *Agricultural Advisory Services in South Africa*, narrates that extension services in South Africa date back to the reconstruction years that followed from 1902 when scientists were imported from England.

The then government employed these scientists to assist in the development of local agriculture by conducting research and disseminating it to farmers. He continues to say that in 1907 the advice and guidance from these English scientists were not always successful due to them being unfamiliar with the local agricultural conditions. This necessitated the South African government to send scientists to study abroad and come back to advance white farmers in South Africa. Bembridge (1991) in his book entitled: *The practice of Agricultural Extension - A training manual*, asserted that the establishment of the Teko Agricultural College in the Eastern Cape in 1905 was the start of extension services in South Africa. The next five years would see the appointment of agricultural demonstrators teaching improved cultivation methods to smallholder farmers. The year 1929 saw the establishment of an agricultural technical services structure, followed in 1930 by the opening of Fort Cox Agriculture College in the former Ciskei which is in the east of the Eastern Cape.

Koch and Terblanché (2013) posited that the first century since the founding of Agricultural extension services in South Africa will be in the year 2025. In other words, these authors suggest that extension services in South Africa started in 1925. The reason/s that contributed to this ambiguity about the origin of extension services in South Africa is unclear; however, one idea that might have led to this is the dualistic nature of the agricultural sector that came about with the colonial regime. Bembridge (1991) explores the events that took place in the black farming community, while Liebenberg (2015) gives an overview of the technical support given to white farmers in South Africa. Koch and Terblanché (2013) reflect on the overall

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

extension structure, diversity (black and white), and challenges encountered by agricultural extension in South Africa since its foundations. However, although these authors have different narratives about how extension came to be in South Africa, what is common among them is that extension started in the 20th century in South Africa. Also, when the new government came into power in 1994, it sought to restructure completely the agricultural system and advisory services to what is seen today.

3. MATERIALS AND METHODS

3.1 Description of the study area

The Eastern Cape is the second largest province of the nine provinces of South Africa. It also has the third-highest population with approximately 6 620 100 people and is among the poorest provinces in the country (Statistics South Africa, 2020). This study was conducted in the villages of Idutywa which are located 30 km from the town of Butterworth.

3.2 Research approach

This study adopted a pragmatic research approach which is also referred to as mixed methods. According to Shorten and Smith (2017), mixed methods refer to a research approach that includes both qualitative and quantitative data in the same study. This research approach is used to obtain a better comprehension of the interrelations and variances between quantitative and qualitative data (Shorten and Smith, 2017). It allowed the participants to share their experiences throughout the research.

3.3 Sample and sampling technique

The target population of the study was farming household residents of Idutywa in the Eastern Cape. A sample of 75 respondents was randomly selected and interviewed for this study. Five villages (15 from each) were randomly selected.

3.4 Data collection

This study used primary data collected via an internet survey. An online semi-structured questionnaire consisting of both open-ended and close-ended questions was used. This data collection method was chosen due to the prevailing issue of Covid-19, considering social distancing regulation. The questionnaire was sent to random household respondents in Ngqamakhwe using social media (WhatsApp, Telegram, and Facebook). The respondents were

10.17159/2413-3221/2022/v50n1a14403

requested to indicate their village, and the results showed that responses were equally distributed in the five villages. Given that the study used a rapid online survey approach to obtain data, it should be stressed that the sample is not representative of the entire Province. Be as it may, the information is useful to provide an understanding of extension services rendered during the ongoing COVID-19 pandemic.

3.5 Data analysis

The data from the questionnaires were coded and captured into a computer using a Microsoft Excel spreadsheet. Thereafter, the data were analysed using STATA computer program. Both descriptive and inferential statistics were utilized for the analysis of data.

3.5.1 Descriptive statistics

Descriptive statistics such as frequencies, percentages, minimum and maximum values, etc. were used to describe the socio-economic attributes of the rural households. Descriptive statistics assist to describe and understand the features of a specific data set by providing summaries of the sample and measures of the data.

3.5.2 Inferential statistics (Binary logistic regression model)

To assess the determinants of access to extension services, the binary logistic regression model was used. The binary logistic regression model is used when the outcome variable has two possible values, and it permits the addition of power terms and explicit interaction (Sperandei, 2014).

The binary regression model is useful in analysing data where the researcher is interested in finding the likelihood of a certain event occurring. In this study, the logistic model is preferred because of its comparative mathematical simplicity and fewer assumptions in theory. Furthermore, logistic regression analysis is more statistically robust in practice and is easier to use and understand than other methods.

10.17159/2413-3221/2022/v50n1a14403

Logit(Pi) =In ($\frac{Pi}{1-Pi}$) = α + β1X1 +…+ βkXk + Ui

In ($\frac{Pi}{1-Pi}$)= Access to extension services

Pi = Probability that a household will have access to extension services

1 − P = Probability that a Household does not have access

α and β = Estimated parameters

X = Explanatory variable

Ui = Error Term

4. RESULTS AND DISCUSSION

4.1 Socio-economic factors of sample households

Table 1 presents the descriptive statistics for the socioeconomic characteristics of households. The results showed that most participants in the study were male (57%). In all five villages, participants were youth with an age range between 18 to 44 years. A large portion of the respondents had either a tertiary (45.3%) or secondary (34.67%) level of education. This is not surprising, given the fact that the study was conducted using an online survey, which is likely to be filled by educated persons who have internet access, own smartphones, engage in social media platforms, and understand the questions without any assistance.

Most of the respondents were household heads, presiding over a household comprising of about two to 15 members on average. Only 21 percent of respondents earned a salary, with a range of R600 to 18400 monthly income. Other main sources of income included farming, self-employment, and government grants. This is in line with a 2020 Statistics South Africa (Stats SA) finding that most of the youth in South Africa are unemployed (StatsSA, 2020). The results presented in Table 1 show that the mean average farming experience is 9 years and ranged between 1 and 27 years. Most of the experienced household heads were able to get more productivity though a timely sowing of crops and avoiding flood irrigation, which led to them saving on water and balanced use of fertilizers. The results indicate that every household had access to land, either for crop or livestock production. Table 1 also indicates that households in the study area owned between 0.12ha to 2.5ha of land with a standard deviation of 0.64ha. Similar findings were reported by Christian *et al*. (2019) who report that at a provincial level, 85% of rural households in the Eastern Cape have access to arable land, whilst 75% have access to shared grazing land.

10.17159/2413-3221/2022/v50n1a14403

Table 1: Socio-economic characteristics of households

Characteristic	**Description**	**Frequency**		**Percent**	
Gender	Male	**43**		**57.33**	
	Female	**32**		**42.67**	
Level of education	Primary	**15**		**20**	
	Secondary	**26**		**34.67**	
	Tertiary	**34**		**45.33**	
Employment status	Yes	**16**		**21.33**	
Member of coop	Yes	**32**		**42.67**	
		Mean	**Std dev.**	**Min**	**Max**
HH Monthly income	Rands	4194.2	3356.3	600	18400
Household size	Number of persons	6.65	2.97	2	15
Prohibition of movements	Land in Ha	0.74	0.64	0.12	2.5
Age	Age (years)	29.12	6.967	18	44
Farming experience	Years of involvement	9.41	5.38	1	27

Source: Survey, 2020

While all the surveyed households had access to land, cultivation was limited to homestead gardens. This can be attributed to the prohibition of movements that were reported above. Some farmers did not participate at all in crop production (3%). Almost every household head indicated that they were involved either in livestock (96%) or crop (97%) or a combination of the two (69%). This is in line with Christian et al., (2020) findings that a majority of households in the study area practiced mixed-farming. The results are shown in Figure 2, below.

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

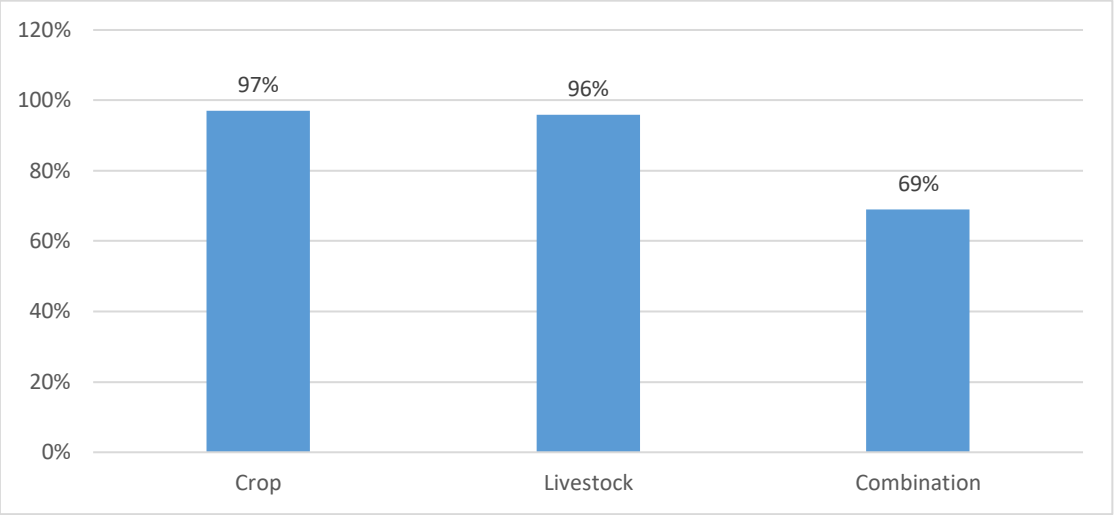

Figure 2: Farming in the study area

4.2 Delivery of agricultural extension during covid-19 in the study area

4.2.1 Access to extension services

In South Africa, agricultural extension services are the most common forms of public sector support for knowledge diffusion and learning. The concept of the extension services sector involves agricultural experts, who teach improved methods of farming in both livestock and cropping enterprises, demonstrate innovations, organise farmer meetings and markets. Among other things, access to agricultural extension services has been an issue in the rural Eastern Cape for years. The results in Figure 3 indicate that of the surveyed households, 61.33% had no access to extension services during the covid-19 pandemic. Again, from the survey, there was little mention of extension delivery concerning input supplying and marketing-related services.

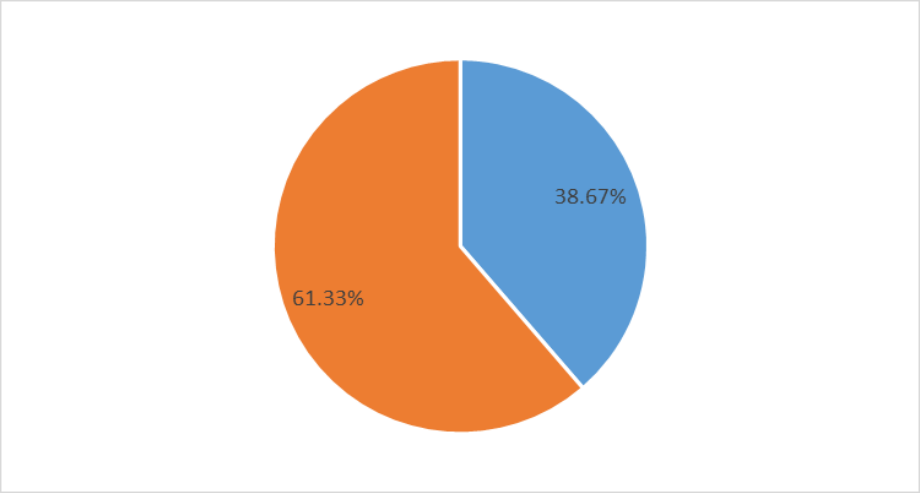

Figure 3: Access to extension services during covid-19

4.3 Information needs

As seen in Table 2, below, seeking information on marketing and farm-related credit is the highest while fertilizer application and storage recorded the lowest frequency.

Table 2: Information needs of farming households

Information need	Frequency	Percent (%)
Fertilizer application	38	50.67
Marketing of produce	62	82.67
Storage	22	29.33
Farm-related credit	59	78.67

Source: Survey, 2021

4.4 Factors affecting farm yields

Surprisingly, only four out of 13 explanatory variables that are significant from the below table were household size, credit need, land size, and a limited number of farmers for training. However, cellphone data significantly influenced farm performance, yet it has a negative coefficient estimate. This means that it was less likely to receive treatment by 1.75193 if they did not have enough cell phone data as recorded in Table 3.

10.17159/2413-3221/2022/v50n1a14403

Table 3: Factors affecting farm yields

Logit regression				Number of obs = 75		
				LR chi2(11) = 22.94		
Log likelihood = -29.862282				Prob > chi2 = 0.0283		
				Pseudo R2 = 0.2775		
Access to extension officers =0, No=1)	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
Household size	.1899646	.0899507	2.11	0.035	.0136645	.3662648
Gender	-.1242723	.3958282	-0.31	0.754	-.9000912	.6515367
Age	.0070563	.0280549	0.25	0.801	-.0479302	.0620429
Material status	-.1795293	.2020639	-0.89	0.374	-.5755673	.2165088
Marketing distance	-.1294232	.5555363	-0.23	0.816	-1.218254	.9594079
Cell phone data	-1.75193	.7119812	-2.46	0.014	-3.147387	-.3564725
Education	.1642027	.259255	0.63	0.526	-.3439277	.6723332
A limited number of farmers for training	.8220865.	.4139518	1.99	0.047	.0107559	1.633417
Employment status	.337616	.4863236	0.69	0.488	-.6155607	1.290793
Storage need	.1335915	.4778287	0.28	0.780	-.8029355	1.070118
Fertilizer application	.5747642	.3987534	1.44	0.149	-.2067781	1.356306
Access to extension officers	.0871878.	.4147174	0.21	0.833	-.7256433	.9000189
_constant	.1171056	1.341711	0.09	0.930	-2.5126	2.746811

Source: Based on STATA processing of field data, 2021

10.17159/2413-3221/2022/v50n1a14403

Table 4 shows the results from the covariate balancing tests both before and after matching. Based on the control and treated variables, the Average Treatment Effect Treated from Kernel, Nearest Neighbours, Radius matching methods were found to be negative. Therefore, we can conclude that if they did not receive the program, the performance per farmer would be reduced by 295.489, 829.035, and 520.672, respectively recorded.

Table 4: Impact of lack of extension services during covid-19. PSM

Output variable	**n. treat.**	**n. contr.**	**Kernel Matching Method**		
			ATT	**Standard error**	**t-value**
Access to extension	57	16	-295.489	1962.781	-0.151
		Nearest Neighbours Matching Method			
			ATT	**Standard error**	**t-value**
Access to extension	57	11	-829.035	1092.450	-0.759
		Radius Matching method			
Access to extension			**ATT**	**Standard error**	**t-value**
	57	16	-520.672	1363.682	-0.382
Model Summary			Number of observations =75 Matches requested =5 Treatment model =Logit		

Source: Based on STATA processing of field data, 2021

5. CONCLUSION AND IMPLICATIONS FOR EXTENSION DELIVERY IN THE FUTURE

This study analysed the extension service delivery in time of covid-19 lockdown in the Eastern Cape. Covid-19 affected residents across the country, with rural communities experiencing the worse of the pandemic. The results showed that there are several households that do not have access to extension services in Idutywa. Factors such as household size, cellphone data, limited movements, and a limited number of farmers for training. However, cell phone data has a

significant influence on the yields, albeit, with a negative coefficient estimate. The results from propensity score matching on Average Treatment Effect on Treated further indicated that farmers need the program despite the covid-19 pandemic. Findings from this study confirm the need for empowering extension workers with modern technologies to meet the needs of households. The study also recommends private-public partnerships in extension service delivery.

6. ACKNOWLEDGEMENTS

The authors are grateful to all those who participated in the data collection and analysis. We are grateful to Dr. Ikechi Agbugba for his comments in earlier drafts of this article.

REFERENCES

AFFUL, D.B. AND LATEGAN, F.S. 2014. Small and medium-scale producers' use and credibility of information sources: implications for public extension's financial sustainability. *South African Journal of Agricultural Extension,* 42 (1): 27-38.

AGHOLOR, A.I. 2012. The quality of extension education delivery among livestock farmers in central Eastern Cape. A case study of Nkonkobe Local Municipality. Unpublished Master's Thesis, University of Fort Hare, Alice.

BEMBRIDGE, T.J. 1991. The practice of agricultural extension- a training manual. DBSA, halfway house.

CHRISTOPLOS, I., 2010. Mobilizing the potential of rural and agricultural extension. Neuchâtel Group.

CHRISTIAN, M., JIBA, P. AND MDODA, L., 2020. Factors Influencing Rain-Fed Agricultural Land Abandonment in Mnquma and Mbashe Municipalities, Eastern Cape. International Journal of Recent Technology and Engineering. 9(2): 2277-3878.

CHRISTIAN, M, LUVHENGO, U, KHOBAI, H, AND AGBUGBA, IK., 2020. Reviewing land access livelihood diversification strategies and factors influencing wellbeing of rural households in Mnquma, Eastern cCape: Implications to extension agents. S. Afr. J. Agric. Ext. 48(2): 113 - 125.

CONRADIE, B.I. 2016. The implications of a weak public extension service for the productivity performance of Karoo agriculture. *South African Journal of Agricultural Extension*, 44(2): 99-109.

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

HALL, R. AND KEPE, T. 2017. Elite capture and state neglect: new evidence on South Africa's land reform. *Review of African Political Economy*, 44(151): 122-130.

HLATSHWAYO, P.P.K. AND WORTH, S.H. 2016. Stakeholders' Perceptions about Visibility and Accountability of the State Agricultural Extension in Nquthu Area, KwaZulu-Natal Province, South Africa. *South African Journal of Agricultural Extension*, 44(2), 174-185.

JONES K.E., PATELN.G., LEVYM..A., STOREYGARD, A., BALK, D, GITTLEMAN J.L., DASZAK P. 2008. Global trends in emerging infectious diseases. Nature 451, 990-993.

KOCH, B. H. AND TERBLANCHÉ, S. E. 2013. An overview of agricultural extension in South Africa. *South African Journal of Agricultural Extension*, 41(1): 107-117.

LIEBENBERG. F. 2015. Agricultural Advisory Services in South Africa. Discussion paper. University of Pretoria: South Africa.

MAOBA, S. 2016. Farmers' perception of agricultural extension service delivery in Germiston region, Gauteng Province, South Africa. *South African Journal of Agricultural Extension* 44 (2):167 –173.

NATIONAL DEPARTMENT OF HEALTH, SOUTH AFRICA. MINISTER OF HEALTH UPDATE [TWITTER] 2020. https://twitter.com/HealthZA/status/1242507959852302336?s=19 (accessed 24 March 2020).

National Department of Health, South Africa. Latest confirmed cases of COVID-19 (23rd March 2020). https://sacoronavirus.co.za/2020/03/23/latest-confirmed-cases-of-covid-19-23rd-march-2020/ (accessed 24 March 2020).

NICD.2020. COVID-19 Weekly Epidemiology Brief Week 18, 2020 www.nicd.ac.za

NKOSI, N.Z. 2017. Level of Access to Agricultural Extension and Advisory Services by Emerging Livestock Farmers in UThungulu District Municipality, KwaZulu-Natal Province. Unpublished Master's Thesis. The University of South Africa.

SIKWELA, M.M. 2013. The impact of farmer support programmes on market access of smallholder farmers in the Eastern Cape and KwaZulu-Natal provinces, South Africa. Ph.D. Thesis. Unpublished dissertation University of Fort Hare Alice, South Africa.

WHO. WHO Director-General's opening remarks at the media briefing on COVID-19-11 March 2020. https://www.who.int/dg/speeches/detail/whodirector-general-s-opening-remarks-at-the-media-briefing-on-covid-19--- 11-march-2020 (accessed April 23, 2020).

Vol. 50 No. 1, 2022: 60-75
10.17159/2413-3221/2022/v50n1a14403

WHO. Coronavirus disease 2019 (COVID-19) situation reports. https:// www.who.int/emergencies/diseases/novel-coronavirus-2019/situationreports (accessed April 23, 2020).

World Health Organization WHO. 2020. Coronavirus disease (COVID-19) Pandemic. https://www.who.int/emergencies/diseases/novel-coronavirus-2019. Accessed 10 April 2020.