Comparative Analysis of the Adoption of Leafy Vegetable Technologies Among Vegetables Farmers in Akwa Ibom and Rivers States, Nigeria

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Abstract
The aim was carried out a comparative study on the adoption of leafy vegetable technologies among vegetables farmers in Akwa Ibom and Rivers States, Nigeria. Structured questionnaire was used to elicit information from, 372 male and female leafy vegetable farmers from 18 Local Government Areas using the quota sampling procedure. Data were analysed using frequencies, percentages, tables, mean scores, standard deviation and ANOVA surveyed. Fluted pumpkin (92%) and water leaf (86.3%) were predominant crops. The available technologies in both states are: fertilizer/organic manure application using Inorganic fertilizer (NPK), improved planting material seedling on fluted pumpkin, field preparation using check basin method and preservation/storage procedure using sorting out diseased and bruised produce as they ranked 1st position. This was closely followed by planting distance for Fluted pumpkin (90X90 cm), harvesting and use of well-ventilated containers such as smooth basket as they ranked second position. Organic fertilizer (compost) exhibited higher adoption (mean score = 3.95) than inorganic fertilizer (NPK) (Mean score = 3.22). The t-test did not find a statistically significant difference in the types of vegetable cultivated, agricultural technologies on leafy vegetable available and leafy vegetable technologies adopted by vegetable farmers between the two states at probability value at 0.05 significant level.

Keywords: *Comparative Analyse, Adoption, Leafy Vegetable Technologies, Farmers*

Introduction

Leafy vegetables are herbaceous plants loaded with nutritional and medicinal properties. Leafy vegetable farms are found everywhere in the world. There are numerous challenges experienced by leafy vegetable farmers not considering the importance of vegetables ranging from its nutritious values, medicinal properties, income generation and its consumption by man and his livestock. Some of the challenges experienced by leafy vegetable farmers includes; scarcity of land, lack of capital, lack of farm input, lack of agricultural training, lack of agricultural extension workers, lack of agricultural aid, poor preservation quality, insect attacks and low market prices (Azad et al, 2014).

Agriculture is an important route out of poverty in most of the developing countries yet the rate of adoption of agricultural technology is considerably low (Mwangi & Kariuki, 2015). Studies by Eseonu & Egbue (2014) revealed that technologies sometimes fail to gain acceptance based on socio-cultural or religious factors. Emerging technologies have not been achieved,

particularly in less-developed countries, due to a combination of cultural beliefs, ethical concerns, regulatory delays and lack of information and understanding of the science and technology being used (Ugochukwu & Phillips, 2018). Agriculture is predominantly a rural phenomenon where majority of the population practice small scale farming (Kinuthia & Mabaya, 2017). With the right policies in accordance with agricultural innovation and investment, the African continent's agriculture could be transformed into a powerhouse not only to feed a growing population but to create decent employment for millions of young people (Tsan et al, 2020).

Based on the intricacies surrounding agriculture, this study investigated the socio-economic impact of the adoption of agricultural technologies on leafy vegetable production in Akwa Ibom and Rivers States, Nigeria. It is imperative not only to develop new agricultural technologies but rather, ascertain if these technologies have a positive influence on leafy vegetable farmers. The specific objectives of this study were to: identify the kinds of leafy vegetables produced; identify the types of leafy vegetables technologies on leafy vegetable production available to vegetable farmers; and examine the leafy vegetables technologies on leafy vegetable production adopted by vegetable farmers in the study area.

The hypotheses that were tested to guide the objectives are:
Ho_1: There is no significant difference in the kinds of leafy vegetables produced in Akwa Ibom and Rivers States.
Ho_2: There is no significant difference in the types of leafy vegetable technologies on available to vegetable farmers in Akwa Ibom and Rivers States.
Ho_3: There is no significant difference in the adoption of leafy vegetable technologies by vegetable farmers between Akwa Ibom and Rivers States.

METHODOLOGY

The study was conducted in two States namely; Akwa Ibom and Rivers. The states are in the South-South which is one of the six geopolitical zones of Nigeria. It comprises six States which include; Akwa Ibom, Bayelsa, Cross Rivers, Delta, Edo and Rivers. The zone stretches along the Atlantic seaboard from the Bight of Benin coast in the west to the Bight of Bonny coast in the east. It encloses much of the Niger Delta, which is instrumental in the environment and economic development of the region. Geographically, the zone is divided with the Central African mangroves in the coastal far south while the major inland eco-regions are from east to west. Akwa Ibom and Rivers States contributed greatly to the Nigerian economy due to extensive oil and natural gas reserves. According to 2006 Nigerian population census, the region has a population of about 26 million people, around 12% of the total population of the country. The typical river delta environment features many mangrove swamps. Rivers State lies between Longitudes of 7.033611. DMS Latitude 4.8396°N and DMS Longitude 6.9112°E (World Population Review, 2022).

The research design for this study was descriptive survey. The population of the study comprised of all male and female registered leafy vegetable farmers in Akwa-Ibom and Rivers State`s Ministries of Agriculture, Nigeria. A total of 1240 registered leafy vegetable farmers as thus; 605 registered leafy vegetable farmers in Akwa Ibom State and 635 registered leafy vegetable farmers in Rivers State. (Rivers State`s Ministry of Agriculture farmers registration data, 2009-2022). Akwa-Ibom State. (Akwa-Ibom State.State`s Ministry of Agriculture

farmers registration data, 2012-2020). The study area, consisting of six distinct agricultural zones in Akwa Ibom State and Rivers State, underwent a thorough clustering process in order to improve accuracy. The application of the quota sampling technique resulted in the random selection of three Local Government Areas from each agricultural zone, resulting in selecting 18 Local Government Areas. These areas, which are synonymous with vegetable farming, were further divided into 54 communities, with each community randomly selected in proportion to the identified Local Government Areas. The random sampling methodology was used to select 378 respondents, consisting of 181 leafy vegetable farmers from Akwa Ibom State and 191 from Rivers State, which constitutes 30% of the total population. Data were primarily sourced and questionnaire, interview schedule and personal observation were the data instrument. The analysis was carried out with the use of descriptive and inferential statistics.

Results And Discussion

Kinds of Leafy Vegetables Cultivated in Rivers and Akwa-Ibom State

Table 1 provides a comprehensive overview of the types of leafy vegetables cultivated by the respondents in the study areas.

Table 1: Percentage Distribution of the Kinds of Leafy Vegetables Cultivated in Rivers and Akwa-Ibom State

s/n	Leafy vegetables	Rivers State Freq. (n=191)	%	Akwa-Ibom State Freq. (n=181)	%	Pooled Freq.	%	Rank
1	African rosewood plant	29	15.2	38	21.0	67	18.0	6th
2	Bitter leaf *(Vernonia amygdalina)*	121	63.4	143	79.0	264	71.0	4th
3	Black pepper (*Piper nigrum)*	14	7.3	20	11.0	34	9.1	10th
4	Bushbuck	10	5.2	19	10.5	29	7.8	11th
5	Curry leaf (*Murraya koenigii*)	34	17.8	30	16.6	64	17.2	7th
6	Fluted pumpkin (*Telferia occidentalis)*	175	91.6	168	92.8	343	92.2	1st
7	Garden egg-leaf (*Solanum aethiopicum*)	26	13.6	20	11.0	46	12.4	8th
8	Green or African Spinach (*Amaranthus hybridus*)	23	12.0	19	10.5	42	11.3	9th
9	Scent leaf (*Ocimum gratissimum*)	132	69.1	153	84.5	285	76.6	3rd
10	Water-leaf (*Talinum triangulare*)	136	71.2	165	91.2	321	86.3	2nd
11	Wild spinach (*Gnetum africanum*)	36	18.8	28	15.5	84	22.6	5th

Field Survey (2023). **Multiple Response**

Table 1 shows valuable insights into the diversity and prevalence of leafy vegetable production. Notably, the predominant leafy vegetable across both Rivers and Akwa-Ibom States is fluted pumpkin, with impressive percentages of 91.2% and 92.8% respectively, resulting in a pooled average of 92%. This signifies the paramount role of fluted pumpkin (Telfairia occidentalis) in the leafy vegetable production landscape within the studied regions. Fluted pumpkin and water leaf (Talinum triangula) emerge as the leading leafy vegetables, with both states boasting high means of 91.2% and 92.8% respectively. These findings align with Aboh and Effiong's (2019) study on the contribution of vegetable production to food security in Uruan Local Government Area of Akwa-Ibom State, where water leaf (Talinum triangular) and fluted pumpkin (Telferia occidentalis) took precedence. The findings also align with Elenwa et al. (2021) study on leafy vegetable consumption pattern amongst rural and urban households in Rivers State, Nigeria where fluted pumpkin (Telferia occidentalis) where consumed by all (100%) of the rural and urban household. Fluted pumpkin, renowned for meeting substantial dietary needs and endorsed by health professionals, plays a pivotal role in promoting nutritional well-being. Research by Paul van et al. (2014) emphasizes the nutritional significance of fluted pumpkin leaves, contributing between 50-70% of recommended dietary needs. Additionally, the cultivation of both uncultivated and cultivated tropical green leafy vegetables has the potential to significantly contribute to the recommended intake of vitamin A for children and women, ranging from 26-100% and 18 - 96% respectively (Ejor, 2021). Beyond fluted pumpkin and water leaf, respondents showcased a commendable diversity in leafy vegetable cultivation. Noteworthy additions include wild spinach (22.6%), African rosewood plant (18%), Curry leaf (17.2%), Garden egg-leaf (12.4%), Green or African Spinach (11.3%), Black pepper (9.1%), and bushbuck (7.8%). This diversity highlights the richness of leafy vegetable production in the study areas, contributing to a varied and nutritious local diet. These findings underscore the multifaceted contributions of leafy vegetables to dietary diversity, nutritional enrichment, and therefore, food security. The prevalence of fluted pumpkin and water leaf, coupled with the diversity in cultivation, showcases the agricultural vibrancy and potential for sustained nutritional benefits within the leafy vegetable production systems in Rivers and Akwa-Ibom States.

Significant Difference in the Kinds of Leafy Vegetables Produced In Akwa Ibom And Rivers States

Ho$_2$: There is no significant difference in the kinds of leafy vegetables produced in Akwa Ibom and Rivers States. Table 2 shows the significant difference in the kinds of leafy vegetables produced in Akwa Ibom and Rivers States.

Table 2: Summary of t-test Analysis Result Showing the Significant Difference in the Kinds of Leafy Vegetables Cultivated in Akwa-Ibom and Rivers States

Variable	*n*	*Mean* $\bar{x}$	*SD*	*Df*	t_{cal}	*Sig. t*	*Level of significance*	*Dec.*
Rivers	11	66.9	60.6	20	-0.223	0.826	0.05	Accepted
Akwa Ibom	11	73.0	67.3					

Field Survey Data 2023, detailed in Appendix

Entries in Table 2 are the results of a t-test analysis comparing the kinds of leafy vegetables cultivated in Akwa-Ibom and Rivers States. For Rivers, the mean is 66.9, and for Akwa-Ibom, it is 73.0. With the degrees of freedom are 20, the calculated t-value is -0.223 and the p-value is 0.826, which is greater than the level of significance is 0.05. Based on this, there is no significant difference in the kinds of leafy vegetables cultivated between Akwa-Ibom and Rivers States. The t-test did not find a statistically significant difference in the kinds of leafy vegetables cultivated between the two states, as the p-value (0.826) is much greater than the chosen level of significance (0.05). Therefore, it is concluded that there is no significant difference in the kinds of leafy vegetables cultivated in Akwa-Ibom and Rivers States based on the provided data.

Types of Agricultural Technologies on Leafy Vegetable Production Available To Vegetable Farmers in Rivers State and Akwa-Ibom States

Tablev3 shows the types of agricultural technologies on leafy vegetable production available to vegetable farmers in Rivers State and Akwa-Ibom States.

Table 3: Percentage Distribution of the Types of Agricultural Technologies on Leafy Vegetable Production Available To Vegetable Farmers in Rivers State and Akwa-Ibom States

S/n	Leafy vegetables	Rivers State Freq. (n=191)	%	Akwa-Ibom State Freq. (n=181)	%	Pooled Freq.	%	Rank
A	**Fertilizer/organic manure application**	175	91.6	168	92.8	343	92.2	1st
1	Inorganic fertilizer (NPK)	175	91.6	168	92.8	343	92.2	1st
2	Organic fertilizer (compost)	132	69.1	153	84.5	285	76.6	4th
B	**Improved planting material (seed, stem/seedling)**	175	91.6	168	92.8	343	92.2	1st
1	Fluted pumpkin	175	91.6	168	92.8	343	92.2	1st
2	Water-leaf	132	69.1	153	84.5	285	76.6	4th
3	Bitter leaf	150	78.5	149	78.4	299	78.5.	3rd
4	Scent leaf	132	69.1	153	84.5	285	76.6	4th
C	**Planting distance**	136	71.2	165	91.2	321	86.3	2nd
1	Fluted pumpkin (90X90 cm)	136	71.2	165	91.2	321	86.3	2nd
2	Water-leaf (25X30 cm)	150	78.5	149	78.4	299	78.5.	3rd
3	Bitter leaf (1X1.5 meter)	150	78.5	149	78.4	299	78.5.	3rd
4	Scent leaf (33X33cm)	132	69.1	153	84.5	285	76.6	4th
D	**Field preparation**	175	91.6	168	92.8	343	92.2	1st
1	Sunken bed	34	17.8	30	16.6	64	17.2	5th

2	Check basin	175	91.6	168	92.8	343	92.2	1st
E	**Pest/weed control**	26	13.6	20	11.0	46	12.4	6th
1	Application of pesticides	23	12.0	19	10.5	42	11.3	7th
2	Application of herbicides	132	69.1	153	84.5	285	76.6	4th
F	**Harvesting**	136	71.2	165	91.2	321	86.3	2nd
1	Done in the morning/evening	132	69.1	153	84.5	285	76.6	4th
G	**Preservation/Storage procedure**	175	91.6	168	92.8	343	92.2	1st
1	Sorting out diseased and bruised produce	175	91.6	168	92.8	343	92.2	1st
2	Use of well-ventilated containers such as smooth basket	136	71.2	165	91.2	321	86.3	2nd
3	Storage in ambient temperature (Bunching – up method)	132	69.1	153	84.5	285	76.6	4th

Field Survey (2023). **Multiple Responses**

Table 3 shows the types of agricultural technologies on leafy vegetable production available to vegetable farmers in Rivers State and Akwa-Ibom States. Notably, the predominant agricultural technologies on leafy vegetable across both Rivers and Akwa-Ibom States was fertilizer/organic manure application using Inorganic fertilizer (NPK), improved planting material seedling on fluted pumpkin, field preparation using check basin method and preservation/storage procedure using sorting out diseased and bruised produce as they ranked 1st position. This was closely followed by planting distance for Fluted pumpkin (90X90 cm), harvesting and use of well-ventilated containers such as smooth basket as they ranked second position. Improved planting material seedling on fluted pumpkin Bitter leaf , planting distance for Water-leaf (25X30 cm), and planting distance for Bitter leaf (1X1.5 cm) ranked third position. Harvesting done in the morning/evening, preservation/storage procedure through storage in ambient temperature, pest/weed control through the application of herbicides, planting space of Scent leaf (33X33cm) and improved planting material (seed, stem/seedling) of scent leaf ranked fourth position. Preparation by Sunken bed ranked fifth, pest/weed control ranked sixth and pest/weed control by application of pesticides ranked seventh respectively. These findings align with Aboh and Effiong's (2019) study on the contribution of using improved seedlings in vegetable production to food security in Uruan Local Government Area of Akwa-Ibom State, where improved water leaf (Talinum triangular) and improved fluted pumpkin (Telferia occidentalis) seedlings took precedence.

Significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers in Akwa Ibom and Rivers States

Ho3: There is no significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers in Akwa Ibom and Rivers States. This is shown in table 4 below.

Table 4 Summary of t-test analysis result showing the significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers in Akwa Ibom and Rivers States

Variable	*n*	*Mean* $\bar{x}$	*SD*	*Df*	t_{cal}	*Sig. t*	*Level of significance*	*Dec.*
Rivers	*18*	3.303	0.501	34	0.008	0.992	0.05	Accepted
Akwa Ibom	*18*	3.01	0.442					

Field Survey Data 2023, detailed in Appendix 10

Table 4 summarizes the results of a t-test analysis comparing the significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers in Akwa Ibom and Rivers States. This is shown in table 4.3b below. For Rivers, the mean level the types of agricultural technologies on leafy vegetable available to vegetable farmers is 3.303, and for Akwa-Ibom, it is 3.01. With the degrees of freedom of 34, the calculated t-value is 0.008. The p-value associated with the t-test is 0.995 which is greater than the level of significance is 0.05. Based on this, there is no significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers in Akwa Ibom and Rivers States. The t-test did not find a statistically significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers between the two states, as the p-value (0.995) is much greater than the chosen level of significance (0.05). Therefore, it is concluded that there is no significant difference in the types of agricultural technologies on leafy vegetable available to vegetable farmers between Akwa-Ibom and Rivers States based on the provided data.

Level of Adoption of Agricultural Technologies in Leafy Vegetable Production in Rivers State and Akwa-Ibom States

Table 5 below provides a comprehensive insight into the adoption of agricultural technologies in leafy vegetable production in Rivers and Akwa-Ibom States.

Table 5: Level of adoption of agricultural technologies in leafy vegetable production in Rivers and Akwa-Ibom States

S/N	Agricultural Technologies	Rivers State (n=191)			Akwa-Ibom State (n=181)			Pooled		
		TS	MS	RE	TS	MS	DE	TS	MS	RE
A	**Fertilizer/organic manure application**									
1	Inorganic fertilizer (NPK)	642	3.36	A	556	3.07	A	1198	3.22	A
2	Organic fertilizer (compost)	722	3.78	A	746	4.12	A	1468	3.95	A
B	**Improved planting material (seed, stem/seedling)**									
1	Fluted pumpkin	689	3.61	A	624	3.45	A	1313	3.53	A
2	Water-leaf	621	3.25	A	629	3.48	A	1250	3.36	A
3	Bitter leaf	685	3.59	A	681	3.76	A	1366	3.67	A
4	Scent leaf	587	3.07	A	555	3.07	A	1142	3.07	A

C	**Planting distance**									
1	Fluted pumpkin (90X90 cm)	632	3.31	A	579	3.2	A	1211	3.26	A
2	Water-leaf (25X30 cm)	587	3.07	A	595	3.29	A	1182	3.18	A
3	Bitter leaf (1X1.5 meter)	602	3.15	A	618	3.41	A	1220	3.28	A
4	Scent leaf (33X33cm)	588	3.08	A	572	3.16	A	1160	3.12	A
D	**Field preparation**									
1	Check basin	662	3.47	A	665	3.67	A	1327	3.57	A
2	Sunken bed	484	2.53	A	553	3.06	A	1037	2.79	D
E	**Pest/weed control**									
1	Application of pesticides	645	3.38	A	512	2.83	D	1157	3.11	A
2	Application of herbicides	379	1.98	D	366	2.02	D	745	2.00	D
F	**Harvesting**									
1	Done in the morning/evening	755	3.95	A	609	3.36	A	1364	3.67	A
G	**Preservation/Storage procedure**									
1	Sorting out diseased and bruised produce	827	4.33	A	705	3.9	A	1532	4.12	A
2	Use of well-ventilated containers such as smooth basket	635	3.32	A	650	3.59	A	1285	3.45	A
3	Storage in ambient temperature (Bunching – up method)	631	3.3	A	556	3.07	A	1187	3.19	A
	Grand mean		**3.30**	**A**		**3.32**	**A**		**3.31**	**A**

Field Survey Data 2022, detailed in Appendix 3
Note: A = Agreed, D = Disagreed, TS = Total Score, MS = Mean Score, n = sample size, Re =Remark

Fertilizer and inorganic manure application garnered substantial adoption, evidenced by a grand mean of 3.59, surpassing the threshold of 3.0 as shown in table 5. Notably, inorganic fertilizer (compost) exhibited a higher level of adoption with a mean score of 3.95, compared to organic fertilizer (NPK) with a mean score of 3.22. This suggests a pronounced inclination towards the use of inorganic fertilizers in the studied areas. For the first four ranked vegetables, namely fluted pumpkin $\bar{x}$=3.61, water-leaf $\bar{x}$=3.25, bitter-leaf $\bar{x}$=3.59 and scent-leaf $\bar{x}$=3.07 amongst others. Improved planting materials saw widespread adoption, with $\bar{x} > 3.0$. The detailed breakdown reveals a progressive adoption process, with a considerable number of respondents advancing to the adoption stage. The recommended planting distances for fluted pumpkin, water-leaf, bitter-leaf, and scent-leaf were all embraced by the farmers, as indicated by $\bar{x} > 3.0$. A closer examination illuminates the stages of awareness, interest, evaluation, trial, and adoption, providing a nuanced understanding of the adoption dynamics, particularly for fluted pumpkin. Agricultural technologies related to field preparation witnessed widespread adoption, with $\bar{x} = 3.12 > 3.0$. However, the sunken bed technique exhibited regional variation, with adoption in Akwa-Ibom ($\bar{x} = 3.06$) surpassing Rivers State ($\bar{x} = 2.53$). The check basin technique demonstrated higher adoption overall ($\bar{x} = 3.57$).

In the domain of pest/weed control, the adoption of pesticide application received favorable responses in both states, with $\bar{x} > 3.0$. However, the application of herbicides did not meet the adoption threshold, indicating a divergence in acceptance among leafy vegetable farmers. The study's exploration of fertilizer application encourages a holistic approach, endorsing the combined use of manures and fertilizers to reduce dependence on inorganic fertilizers. This aligns with contemporary agricultural wisdom that seeks to balance productivity with sustainability (Kifayatullah et al., 2020). Harvesting recommendations, including the timing of morning or evening harvests, garnered substantial adoption with $\bar{x} = 3.67$. Additionally, technologies related to the preservation and storage of leafy vegetables, such as sorting out diseased and bruised produce, using well-ventilated containers, and employing ambient temperature storage (Bunching-up method), were widely embraced with $\bar{x} > 3.0$. The findings underscore the dynamic landscape of technology adoption in leafy vegetable production, offering valuable insights for further research and the refinement of agricultural practices in Rivers and Akwa-Ibom States.

Significant difference in the agricultural technologies on leafy vegetable production adopted by vegetable farmers between Akwa Ibom and Rivers States

Ho_4: There is no significant difference in the agricultural technologies on leafy vegetable production adopted by vegetable farmers between Akwa Ibom and Rivers States. This is shown in table 6.

Table 6 Summary of t-test Analysis Result Showing the Significant Difference in the level of adoption of agricultural technologies in leafy vegetable production in Akwa-Ibom and Rivers States

Variable	*n*	*Mean* $\bar{x}$	*SD*	*Df*	t_{-cal}	*Sig. t*	*Level of significance*	*Dec.*
Rivers	*18*	3.307	0.511	34	0.007	0.995	0.05	Accepted
Akwa Ibom	*18*	3.06	0.462					

Field Survey Data 2023, detailed in Appendix 10

Table 6 summarizes the results of a t-test analysis comparing the level of adoption of agricultural technologies in leafy vegetable production between Akwa-Ibom and Rivers States. For Rivers, the mean level of adoption is 3.307, and for Akwa-Ibom, it is 3.06. With the degrees of freedom of 34, the calculated t-value is 0.007. The p-value associated with the t-test is 0.995 which is greater than the the level of significance is 0.05. Based on this, there is no significant difference in the level of adoption of agricultural technologies in leafy vegetable production between Akwa-Ibom and Rivers States. The t-test did not find a statistically significant difference in the level of adoption between the two states, as the p-value (0.995) is much greater than the chosen level of significance (0.05). Therefore, it is concluded that there is no significant difference in the level of adoption of agricultural technologies in leafy vegetable production between Akwa-Ibom and Rivers States based on the provided data.

Conclusion

There are vegetable farmers in Akwa Ibom and Rivers States who cultivates mostly fluted pumpkin (Telferia occidentalis), water-leaf (*Talinum triangulare*) and bitter leaf *(Vernonia*

amygdalina. These farmers' were exposed to various types' leafy vegetables available to them. Notably, some of these technologies were adopted by these vegetable farmers such as the application of fertilizers, planting materials and field preparation techniques. The t-test did not find a statistically significant difference in the types of vegetable cultivated, agricultural technologies on leafy vegetable available and leafy vegetable technologies adopted by vegetable farmers between the two states.

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