Geospatial Mapping of Fish Farms in Anambra State Using GIS Approach

Ojiako, J.C., Okafor, C. M., Igbokwe, E.C

Abstract-Recent survey in technical assistance to fisheries in developing countries point to the difficulties in formulating and implementing policy and plans for fishery development. A problem underlining policy and planning in fisheries is that it has been difficult to make a comprehensive analysis of the suitability of the environment, human, and economic resources available for development. Anambra state in particular is faced with a myriad of problem as a result of inability to combine data sources related to fishery in a meaningful way, they lack the capacity to evaluate fishery potentials in the state as a result of ineffective management of these fishery related data sources. This paper is focused on the Geospatial mapping of fish farms using GIS approach .This was achieved through the following objectives: acquisition of base map of the study area showing boundary locations, Creation of spatial and aspatial database of the area to serve the purpose of the study and performing analysis to show the potential of GIS in Geospatial mapping of fish farms in the state. The methodology adopted included: the acquisition of primary and secondary data within the study area, data processing and analysis amongst others. The software used included: ArcGIS10.3 and Microsoft excel The result of GIS analysis showed attribute database tables, Digital Thematic Maps and GIS query results. It is therefore recommended amongst others that the results of this study should serve as a decision support system in management of fish farms in the state.

Keywords: Economic Resources, Database, Fisheries, GIS,

1. INTRODUCTION

Recent survey in technical assistance to fisheries in developing countries point to the difficulties in formulating and implementing policy and plans for fishery development. Application of geographical information system in fisheries management is to promote and protect the productivity of fishery in a way to ensure socioeconomic benefit, environmental sustainability and also maximizing economic yield. Nigeria is a coastal state with a lot of fisheries resources both in marine and inland waters. The potentials for aquaculture is no doubt enormous with12.5 million hectares estimated to be suitable for aquaculture development in fresh water and marine environment (Gaffar 1996). Nigeria is a coastal state with a lot of fisheries resources both in marine and inland waters, the potentials for aquaculture is no doubt enormous with 12.5million hectares estimated to be suitable for aquaculture development in freshwater and marine environment (Gaffar 1996).

Anambra state in particular is faced with a myraid of problem as a result of inability to combine data sources related to fishery in a meaningful way,

they lack the capacity to evaluate fishery potentials in the state as a result of ineffective management of these fishery related data sources. there is no knowledge of available area with target species of fish to ensure sufficient stock density, socioeconomic benefit, environmental sustainability and also to maximize economic yield.

2. STUDY AREA

Anambra State is one of the five eastern states of Nigeria which covers an area of 4,416km^{2,} 70% of which is arable land lying within Latitude 05° 40' N and 06°48'N and Longitude 06°37'E and 07°27'E(NTM projection) (see figure 1a&b.) It has a population of 4,182,022 people according to the 2006 population Census.

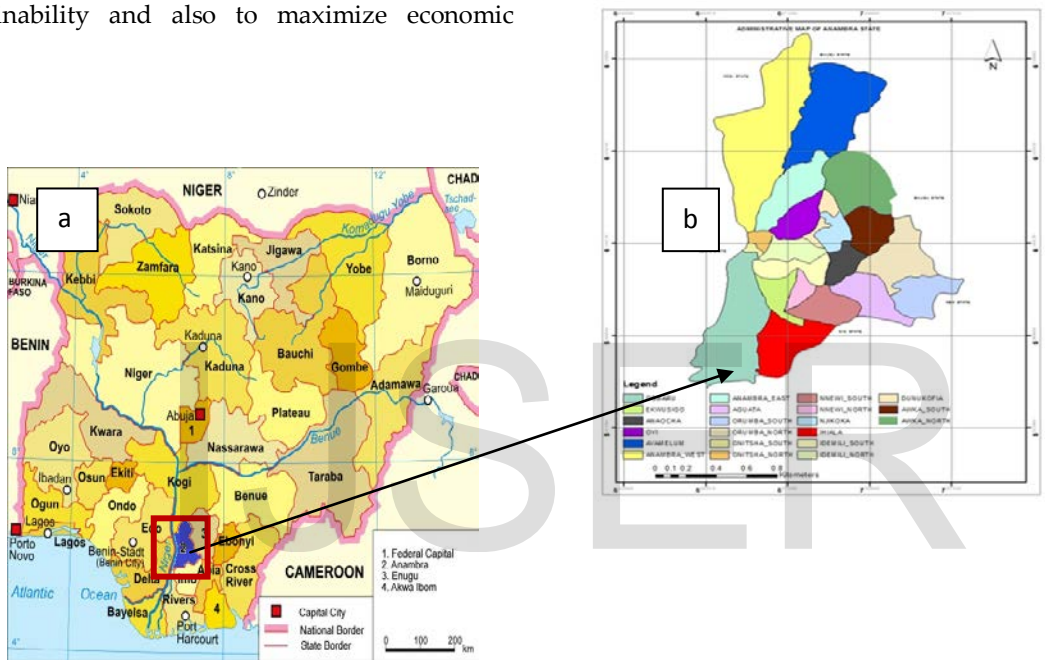


Figure 1 (a) Map of Nigeria showing Anambra State (b) Map of Anambra State showing the L.G.A

3. DATA AND METHODS

3.1 Data used

Data used for this study was principally administrative map of Anambra State showing local government boundaries. Other useful data were obtained from literatures and statistical files of CAAP offices. Oral interviews and through fields capture.

i) Materials available in academic journals, conference paper technical paper of FAO (Food and Agricultural Organization) relevant text, gazettal brochures, internet etc.

ii) Location of fish ponds and other sites of interest were obtained using hand held GPS.

iii) Administrative map of Anambra State was used.

3.2. Data Acquisition

3.2.1 The primary data

The primary data set were obtained through field visit. Position of the fish pond were obtained using handheld GPS (Etrex H Garmin 76S). The geometric dataset of all the fish ponds including the study area were obtained using handheld GPS and was downloaded into the laptop using map source software which was then exported to Microsoft excel sheet.

3.2.2 The Secondary data

The secondary dataset needed were obtained through digitization of available map data, such as Anambra State Administrative Map showing road network, towns, rivers, and location of point of interest.

3.3 Database Creation

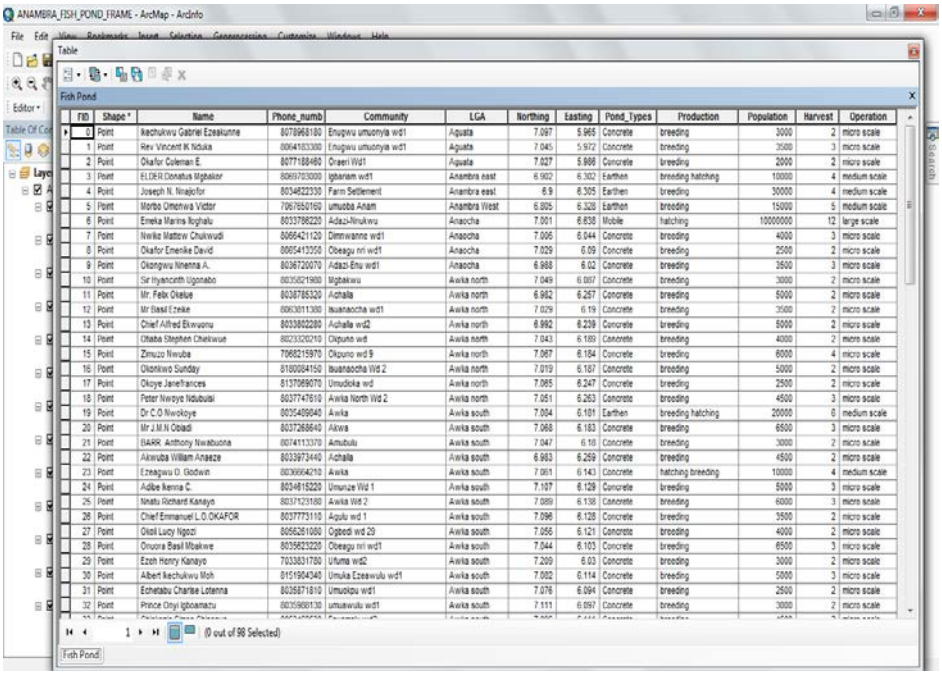
The creation of a structured, digital database is the most important and complex task upon which the usefulness of the cadastral information system depends. Database design is the process of producing a detailed data model of a database (Hernandez, 2012). Digital database design is one of the core tasks in developing any GIS application, it is also called data modeling which is the process by which the real world entities and their inter-relationships are analyzed and modeled in such a way that maximum benefits are derived while utilizing a minimum amount of data Kufoniyi (1998). The entire attribute data gathered through oral interview and records of Catfish Farmers Association of Nigeria Anambra State Chapter was used for the basis of the GIS database creation which was created digitally using spreadsheet. In order to create a database, tables were created and were linked to ArcGIS shape files

3.4 Data Processing and Analysis:

The data obtained from the field were downloaded from the handheld GPS into the laptop using map source software which was exported to Microsoft Excel for editing and inputting of the names of fish ponds obtained. Columns were also created in Excel environment to enable coding of the feature as it relates to the maps. The shapefiles for each features such as boundary, rivers, LGA, towns, roads, sandune, fish ponds, e.t.c were created using arc map.

4. RESULTS

Figure 2 shows the attribute table of the fish farms in Anambra state. This includes the details of each fish farm such as names, phone numbers, co ordinates, operations, harvest, populations, fish pond type, production, community and local govt. area. Figure 3 shows the distribution of fish farms in Anambra state with all its spatial data such as roads, towns, rivers, fish ponds, lake, sand dunes, water bodies etc.



FID	Shape *	Name	Phone_numb	Community	LGA	Northing	Easting	Pond_Types	Production	Population	Harvest	Operation
0	Point	Ikechukwu Gabriel Ezeakunne	8078968189	Enugwu umuonyia wd1	Aguata	7.097	5.965	Concrete	breeding	3000	2	micro scale
1	Point	Rev Vincent IK Nduka	8064183300	Enugwu umuonyia wd1	Aguata	7.045	5.972	Concrete	breeding	3500	3	micro scale
2	Point	Okafor Coleman E	8077188480	Oraeri Wd1	Aguata	7.027	5.988	Concrete	breeding	2000	2	micro scale
3	Point	ELDER Donatus Mgbakor	8069703000	Igbariam wd1	Anambra east	6.902	6.302	Earthen	breeding hatching	10000	4	medium scale
4	Point	Joseph N. Nnajiofor	8034822330	Farm Settlement	Anambra east	6.9	6.305	Earthen	breeding	30000	4	medium scale
5	Point	Morbo Ornenwa Victor	7067650160	umuoba Anam	Anambra West	6.805	6.328	Earthen	breeding	15000	5	medium scale
6	Point	Emeka Marins Ikghalu	8033788220	Adazi-Nnukwu	Anaocha	7.001	6.838	Mobile	hatching	10000000	12	large scale
7	Point	Nwike Matthew Chukwudi	8066421120	Dimnwanne wd1	Anaocha	7.006	6.844	Concrete	breeding	4000	3	micro scale
8	Point	Okafor Emenike David	8065413250	Obeagu nri wd1	Anaocha	7.029	6.09	Concrete	breeding	2500	2	micro scale
9	Point	Okongwu Nnenna A.	8036720070	Adazi-Enu wd1	Anaocha	6.988	6.02	Concrete	breeding	3500	3	micro scale
10	Point	Sir Ifeyanenth Ugonabo	8035021900	Mgbakwu	Awka north	7.049	6.097	Concrete	breeding	3000	2	micro scale
11	Point	Mr. Felix Okeke	8036785320	Achalla	Awka north	6.982	6.257	Concrete	breeding	5000	2	micro scale
12	Point	Mr Basil Ezeke	8063011300	Isuanaocha wd1	Awka north	7.029	6.19	Concrete	breeding	3500	2	micro scale
13	Point	Chief Alfred Ekwuonu	8033802280	Achalla wd2	Awka north	6.992	6.239	Concrete	breeding	5000	2	micro scale
14	Point	Otaba Stephen Chekwue	8023320210	Okpuno wd	Awka north	7.043	6.189	Concrete	breeding	4000	2	micro scale
15	Point	Zimuzo Nwuba	7068215970	Okpuno wd 9	Awka north	7.067	6.184	Concrete	breeding	6000	4	micro scale
16	Point	Okonkwo Sunday	8180084150	Isuanaocha Wd 2	Awka north	7.019	6.187	Concrete	breeding	5000	2	micro scale
17	Point	Okoye Janefrances	8137089070	Umudioka wd	Awka north	7.065	6.247	Concrete	breeding	2500	2	micro scale
18	Point	Peter Nwoye Ndubuisi	8037747610	Awka North Wd 2	Awka north	7.051	6.263	Concrete	breeding	4500	3	micro scale
19	Point	Dr C.O Nwokoye	8035499640	Awka	Awka south	7.054	6.101	Earthen	breeding hatching	20000	6	medium scale
20	Point	Mr J.M.N Obiadi	8037268640	Akwa	Awka south	7.068	6.183	Concrete	breeding	6500	3	micro scale
21	Point	BARR. Anthony Nwabuona	8074113370	Amubulu	Awka south	7.047	6.18	Concrete	breeding	3000	2	micro scale
22	Point	Akwuba William Anaeze	8033973440	Achalla	Awka south	6.983	6.259	Concrete	breeding	4500	2	micro scale
23	Point	Ezeagwu O. Godwin	8036664210	Awka	Awka south	7.061	6.143	Concrete	hatching breeding	10000	4	medium scale
24	Point	Adibe Ikenna C.	8034815220	Umunze Wd 1	Awka south	7.107	6.129	Concrete	breeding	5000	3	micro scale
25	Point	Nnatu Richard Kanayo	8037123180	Awka Wd 2	Awka south	7.089	6.138	Concrete	breeding	6000	3	micro scale
26	Point	Chief Emmanuel L.O.OKAFOR	8037773110	Aguiu wd 1	Awka south	7.096	6.128	Concrete	breeding	3500	2	micro scale
27	Point	Okoli Lucy Ngozi	8056261080	Ogbodi wd 29	Awka south	7.056	6.121	Concrete	breeding	4000	2	micro scale
28	Point	Onuora Basil Mbakwe	8035823220	Obeagu nri wd1	Awka south	7.044	6.103	Concrete	breeding	6500	3	micro scale
29	Point	Ezoh Henry Kanayo	7033831780	Ufuma wd2	Awka south	7.209	6.03	Concrete	breeding	3000	2	micro scale
30	Point	Albert Ikechukwu Moh	8151904340	Umuka Ezeawulu wd1	Awka south	7.002	6.114	Concrete	breeding	5000	3	micro scale
31	Point	Echetabu Charles Lotenna	8035871810	Umuokpu wd1	Awka south	7.076	6.094	Concrete	breeding	2500	2	micro scale
32	Point	Prince Onyi Igboamatu	8035968130	umuawulu wd1	Awka south	7.111	6.097	Concrete	breeding	3000	2	micro scale

Fig 2 the attribute table of the fish farms in Anambra state.

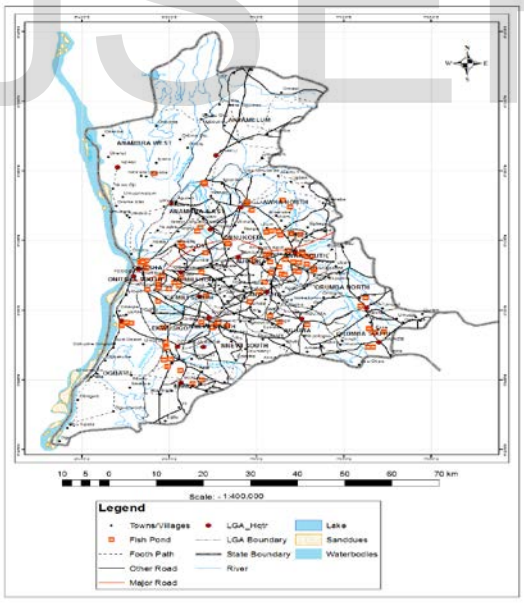


Fig 3 the distribution of fish farms in Anambra state

4.1 Query 2 (Fish Farms by L.G.A)

Figure 4: shows Query builder by LGA.

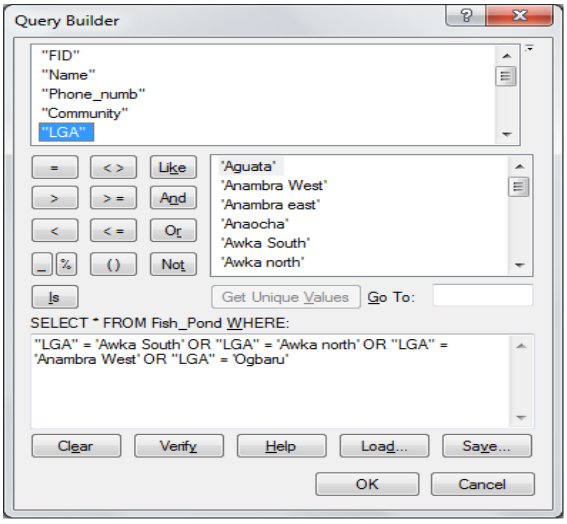
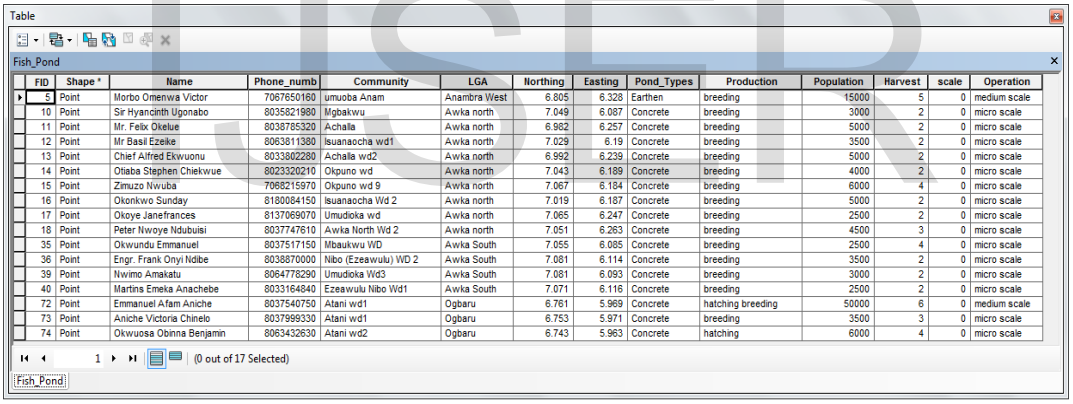


Fig. 4: Query builder by LGA.



FID	Shape *	Name	Phone_numb	Community	LGA	Northing	Easting	Pond_Types	Production	Population	Harvest	scale	Operation
5	Point	Morbo Omenwa Victor	7067650160	umuoba Anam	Anambra West	6.805	6.328	Earthen	breeding	15000	5	0	medium scale
10	Point	Sir Hyancinth Ugonabo	8035821980	Mgbakwu	Awka north	7.049	6.087	Concrete	breeding	3000	2	0	micro scale
11	Point	Mr. Felix Okelue	8038785320	Achalla	Awka north	6.982	6.257	Concrete	breeding	5000	2	0	micro scale
12	Point	Mr Basil Ezeike	8063811380	Isuanaocha wd1	Awka north	7.029	6.19	Concrete	breeding	3500	2	0	micro scale
13	Point	Chief Alfred Ekwuonu	8033802280	Achalla wd2	Awka north	6.992	6.239	Concrete	breeding	5000	2	0	micro scale
14	Point	Otiaba Stephen Chiekwue	8023320210	Okpuno wd	Awka north	7.043	6.189	Concrete	breeding	4000	2	0	micro scale
15	Point	Zimuzo Nwuba	7068215970	Okpuno wd 9	Awka north	7.067	6.184	Concrete	breeding	6000	4	0	micro scale
16	Point	Okonkwo Sunday	8180084150	Isuanaocha Wd 2	Awka north	7.019	6.187	Concrete	breeding	5000	2	0	micro scale
17	Point	Okoye Janefrances	8137069070	Umudioka wd	Awka north	7.065	6.247	Concrete	breeding	2500	2	0	micro scale
18	Point	Peter Nwoye Ndubuisi	8037747610	Awka North Wd 2	Awka north	7.051	6.263	Concrete	breeding	4500	3	0	micro scale
35	Point	Okwundu Emmanuel	8037517150	Mbaukwu WD	Awka South	7.055	6.085	Concrete	breeding	2500	4	0	micro scale
36	Point	Engr. Frank Onyi Ndibe	8038870000	Nibo (Ezeawulu) WD 2	Awka South	7.081	6.114	Concrete	breeding	3500	2	0	micro scale
39	Point	Nwimo Amakatu	8064778290	Umudioka Wd3	Awka South	7.081	6.093	Concrete	breeding	3000	2	0	micro scale
40	Point	Martins Emeka Anachebe	8033164840	Ezeawulu Nibo Wd1	Awka South	7.071	6.116	Concrete	breeding	2500	2	0	micro scale
72	Point	Emmanuel Afam Aniche	8037540750	Atani wd1	Ogbaru	6.761	5.969	Concrete	hatching breeding	50000	6	0	medium scale
73	Point	Aniche Victoria Chinelo	8037999330	Atani wd1	Ogbaru	6.753	5.971	Concrete	breeding	3500	3	0	micro scale
74	Point	Okwuosa Obinna Benjamin	8063432630	Atani wd2	Ogbaru	6.743	5.963	Concrete	hatching	6000	4	0	micro scale

Fig 5: Attribute table results of the query builder by local govt.

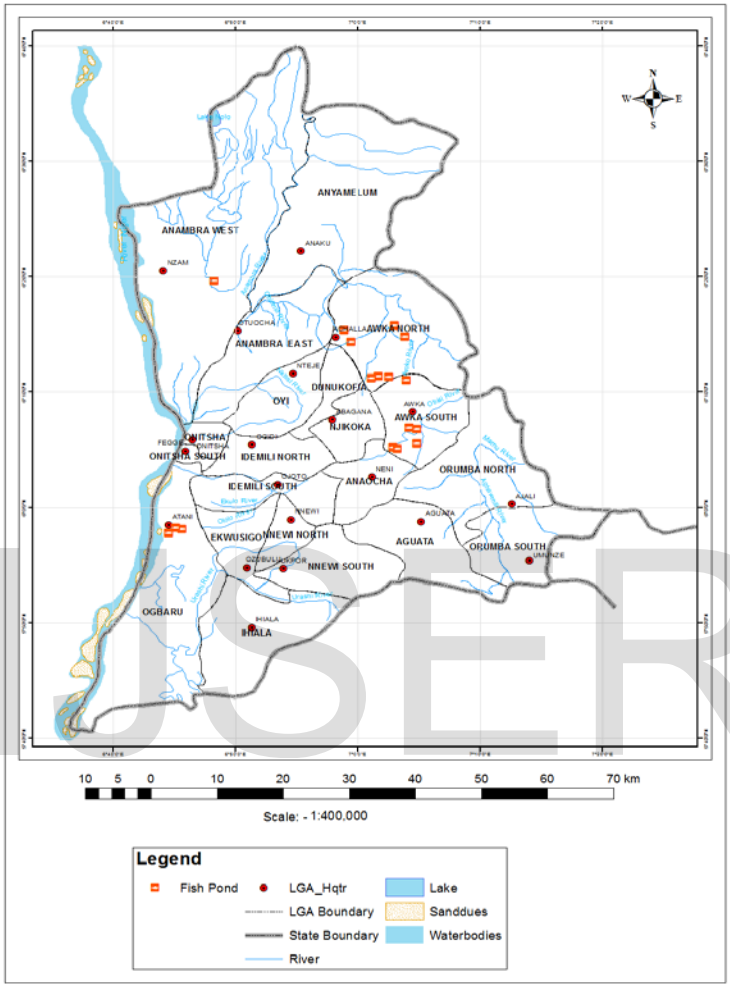


Fig 6: Map showing the query results by local govt. Area.

Fig. 4 shows the query builder by local govt. this is a query command to show all the local govt. within the study area. Fig 5 shows the attribute table results of the query builder by local govt. fig 6 shows the Map of the query results by local govt.

4.2 Query 3 (Pond Type)

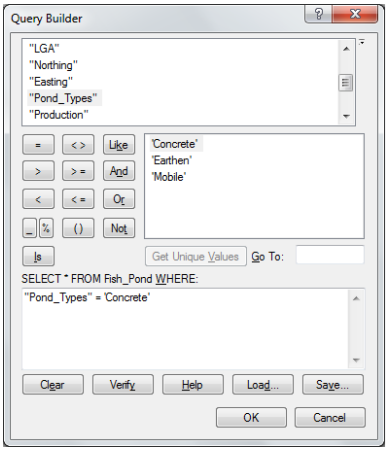
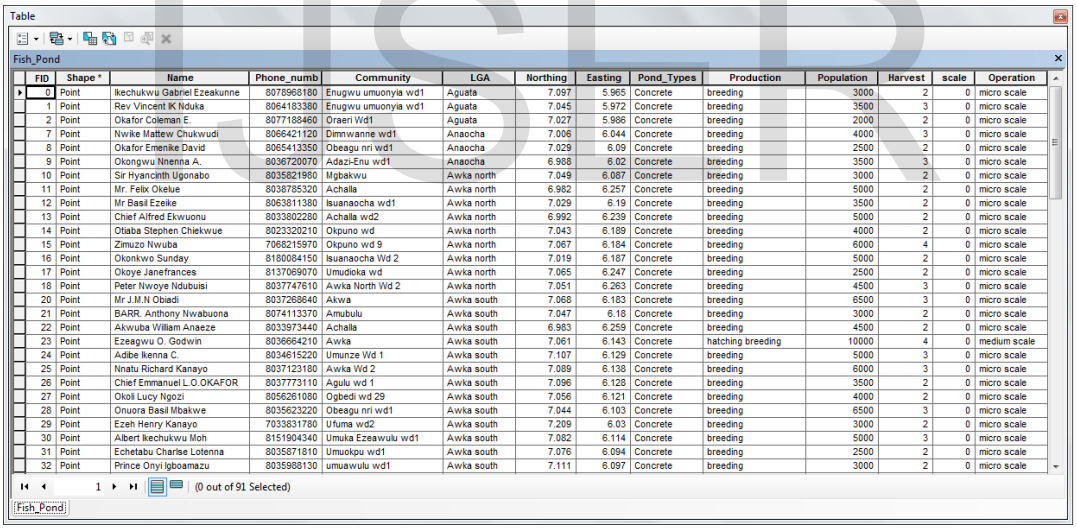


Fig 7: Query builder by pond type.



FID	Shape *	Name	Phone_numb	Community	LGA	Northing	Easting	Pond_Types	Production	Population	Harvest	scale	Operation
0	Point	Ikechukwu Gabriel Ezeakunne	8078968180	Enugwu umuonyia wd1	Aguata	7.097	5.965	Concrete	breeding	3000	2	0	micro scale
1	Point	Rev Vincent IK Nduka	8064183380	Enugwu umuonyia wd1	Aguata	7.045	5.972	Concrete	breeding	3500	3	0	micro scale
2	Point	Okafor Coleman E.	8077188460	Oraeri Wd1	Aguata	7.027	5.986	Concrete	breeding	2000	2	0	micro scale
7	Point	Nwike Mattew Chukwudi	8066421120	Dimnwanne wd1	Anaocha	7.006	6.044	Concrete	breeding	4000	3	0	micro scale
8	Point	Okafor Emenike David	8065413350	Obeagu nri wd1	Anaocha	7.029	6.09	Concrete	breeding	2500	2	0	micro scale
9	Point	Okongwu Nnenna A.	8036720070	Adazi-Enu wd1	Anaocha	6.988	6.02	Concrete	breeding	3500	3	0	micro scale
10	Point	Sir Hyancinth Ugonabo	8035821980	Mgbakwu	Awka north	7.049	6.087	Concrete	breeding	3000	2	0	micro scale
11	Point	Mr. Felix Okeke	8038785320	Achalla	Awka north	6.982	6.257	Concrete	breeding	5000	2	0	micro scale
12	Point	Mr Basil Ezeike	8063811380	Isuanaocha wd1	Awka north	7.029	6.19	Concrete	breeding	3500	2	0	micro scale
13	Point	Chief Alfred Ekwuonu	8033802280	Achalla wd2	Awka north	6.992	6.239	Concrete	breeding	5000	2	0	micro scale
14	Point	Otiaba Stephen Chiekwue	8023320210	Okpuno wd	Awka north	7.043	6.189	Concrete	breeding	4000	2	0	micro scale
15	Point	Zimuzo Nwuba	7068215970	Okpuno wd 9	Awka north	7.067	6.184	Concrete	breeding	6000	4	0	micro scale
16	Point	Okonkwo Sunday	8180084150	Isuanaocha Wd 2	Awka north	7.019	6.187	Concrete	breeding	5000	2	0	micro scale
17	Point	Okoye Janefrances	8137069070	Umudioka wd	Awka north	7.065	6.247	Concrete	breeding	2500	2	0	micro scale
18	Point	Peter Nwoye Ndubuisi	8037747610	Awka North Wd 2	Awka north	7.051	6.263	Concrete	breeding	4500	3	0	micro scale
20	Point	Mr J.M.N Obiadi	8037268640	Akwa	Awka south	7.068	6.183	Concrete	breeding	6500	3	0	micro scale
21	Point	BARR. Anthony Nwabuona	8074113370	Amubulu	Awka south	7.047	6.18	Concrete	breeding	3000	2	0	micro scale
22	Point	Akwuba William Anaeze	8033973440	Achalla	Awka south	6.983	6.259	Concrete	breeding	4500	2	0	micro scale
23	Point	Ezeagwu O. Godwin	8036664210	Awka	Awka south	7.061	6.143	Concrete	hatching breeding	10000	4	0	medium scale
24	Point	Adibe Ikenna C.	8034615220	Umunze Wd 1	Awka south	7.107	6.129	Concrete	breeding	5000	3	0	micro scale
25	Point	Nnatu Richard Kanayo	8037123180	Awka Wd 2	Awka south	7.089	6.138	Concrete	breeding	6000	3	0	micro scale
26	Point	Chief Emmanuel L.O.OKAFOR	8037773110	Agulu wd 1	Awka south	7.096	6.128	Concrete	breeding	3500	2	0	micro scale
27	Point	Okoli Lucy Ngozi	8056281080	Ogbedi wd 29	Awka south	7.056	6.121	Concrete	breeding	4000	2	0	micro scale
28	Point	Onuora Basil Mbakwe	8035623220	Obeagu nri wd1	Awka south	7.044	6.103	Concrete	breeding	6500	3	0	micro scale
29	Point	Ezeh Henry Kanayo	7033831780	Ufuma wd2	Awka south	7.209	6.03	Concrete	breeding	3000	2	0	micro scale
30	Point	Albert Ikechukwu Moh	8151904340	Umuka Ezeawulu wd1	Awka south	7.082	6.114	Concrete	breeding	5000	3	0	micro scale
31	Point	Echetabu Charlse Lotenna	8035871810	Umuokpu wd1	Awka south	7.076	6.094	Concrete	breeding	2500	2	0	micro scale
32	Point	Prince Onyi Igboamazu	8035988130	umuawulu wd1	Awka south	7.111	6.097	Concrete	breeding	3000	2	0	micro scale

Fig 8: Attribute table result of query builder by pond type

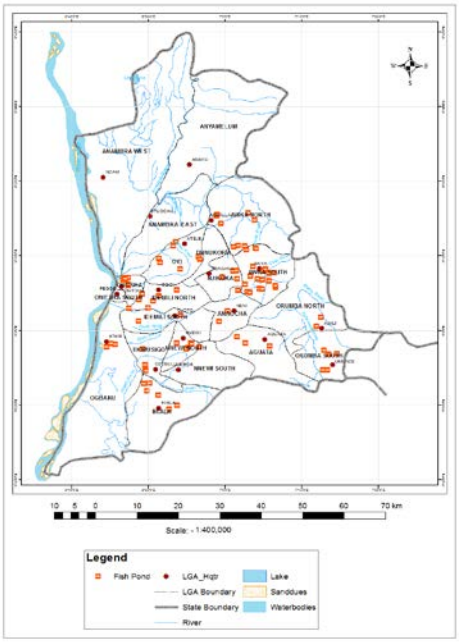


Fig 9: Map showing query results by pond type.

Fig. 7 shows the query builder by pond types. This is a query command to show the pond types used within the study area. Fig 8 shows the attributes table results of the query builder by pond types. Fig 9 shows the Map of the query result by pond types.

4.3 Query 4 (Pond Type and Operations)

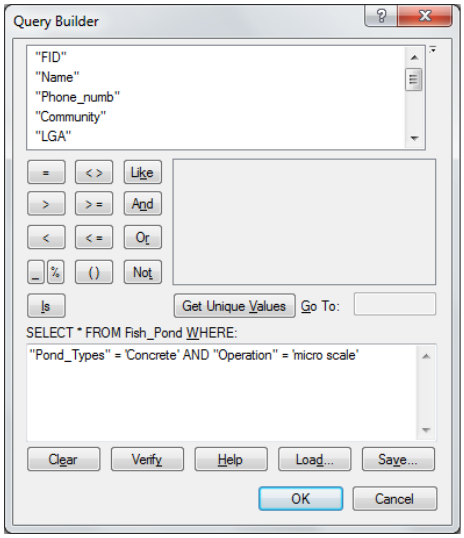
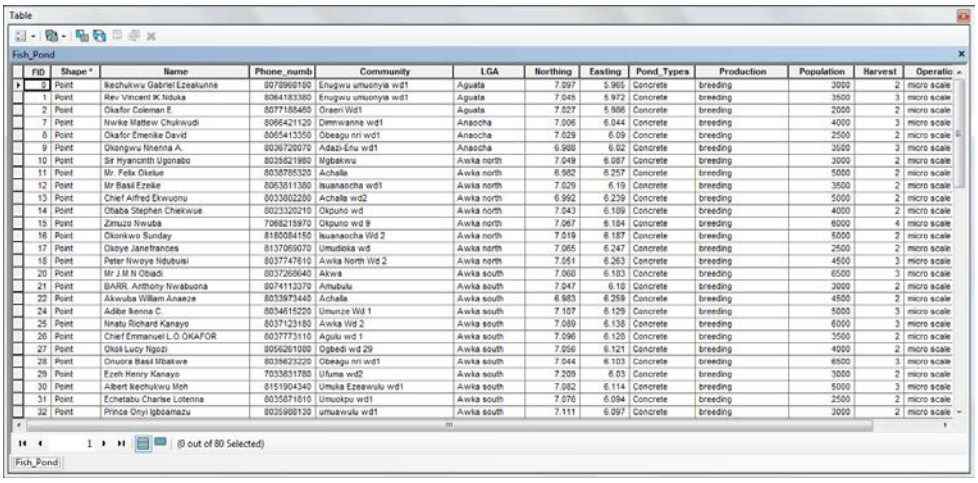


Fig.10: Query builder by pond type and operations



Table

Fish_Pond

FID	Shape *	Name	Phone_numb	Community	LGA	Northing	Easting	Pond_Types	Production	Population	Harvest	Operatio
0	Point	Ikechukwu Gabriel Ezeakunne	8078968100	Enugwu umuonyia wd1	Aguata	7.097	5.965	Concrete	breeding	3000	2	micro scale
1	Point	Rev Vincent IK Nduka	8064183380	Enugwu umuonyia wd1	Aguata	7.045	5.972	Concrete	breeding	3500	3	micro scale
2	Point	Okafor Coleman E	8077188465	Oraeri Wd1	Aguata	7.027	5.988	Concrete	breeding	2000	2	micro scale
7	Point	Nwike Mattew Chukwudi	8066421120	Dimnwanne wd1	Anaocha	7.006	6.044	Concrete	breeding	4000	3	micro scale
8	Point	Okafor Emenike David	8065413350	Obeagu nri wd1	Anaocha	7.029	6.09	Concrete	breeding	2500	2	micro scale
9	Point	Okongwu Nnenna A.	8036720070	Adazi-Enu wd1	Anaocha	6.988	6.02	Concrete	breeding	3000	3	micro scale
10	Point	Sir Nyancinth Uponabo	8035821980	Mgbakwu	Awka north	7.049	6.087	Concrete	breeding	3000	2	micro scale
11	Point	Mr. Felix Okeke	8058765320	Achalla	Awka north	6.982	6.257	Concrete	breeding	5000	2	micro scale
12	Point	Mr Basil Ezeike	8063811380	Isuanaocha wd1	Awka north	7.029	6.19	Concrete	breeding	3500	2	micro scale
13	Point	Chief Alfred Ekwuonu	8033602260	Achalla wd2	Awka north	6.992	6.239	Concrete	breeding	5000	2	micro scale
14	Point	Obiaba Stephen Chekwube	8023320210	Okpuno wd	Awka north	7.043	6.189	Concrete	breeding	4000	2	micro scale
15	Point	Zimuzo Nwuba	7068215970	Okpuno wd 9	Awka north	7.067	6.184	Concrete	breeding	6000	4	micro scale
16	Point	Okonkwo Sunday	8180084150	Isuanaocha Wd 2	Awka north	7.019	6.187	Concrete	breeding	5000	2	micro scale
17	Point	Okoye Janefrances	8137069070	Umudioka wd	Awka north	7.065	6.247	Concrete	breeding	2500	2	micro scale
18	Point	Peter Nwoye Ndubuisi	8037747610	Awka North Wd 2	Awka north	7.051	6.263	Concrete	breeding	4500	3	micro scale
20	Point	Mr J.M.N Obadi	8037268640	Akwa	Awka south	7.068	6.183	Concrete	breeding	6500	3	micro scale
21	Point	BARR. Anthony Nwabuona	8074113070	Amubulu	Awka south	7.047	6.18	Concrete	breeding	3000	2	micro scale
22	Point	Akwuba William Anaeze	8033973440	Achalla	Awka south	6.983	6.259	Concrete	breeding	4500	2	micro scale
24	Point	Adibe Ikenna C.	8034815220	Umunze Wd 1	Awka south	7.107	6.129	Concrete	breeding	5000	3	micro scale
25	Point	Nnatu Richard Kanayo	8037123180	Awka Wd 2	Awka south	7.089	6.138	Concrete	breeding	6000	3	micro scale
26	Point	Chief Emmanuel L.O. OKAFOR	8037773110	Agulu wd 1	Awka south	7.096	6.126	Concrete	breeding	3500	2	micro scale
27	Point	Okoli Lucy Ngozi	8056261080	Ogbedi wd 29	Awka south	7.056	6.121	Concrete	breeding	4000	2	micro scale
28	Point	Onuora Basil Mbakwe	8035823220	Obeagu nri wd1	Awka south	7.044	6.103	Concrete	breeding	6500	3	micro scale
29	Point	Ezeh Henry Kanayo	7033831780	Ufuma wd2	Awka south	7.209	6.03	Concrete	breeding	3000	2	micro scale
30	Point	Albert Ikechukwu Moh	8151904340	Umuka Ezeawulu wd1	Awka south	7.082	6.114	Concrete	breeding	5000	3	micro scale
31	Point	Echetabu Charise Lotenna	8035871810	Umuokpu wd1	Awka south	7.076	6.094	Concrete	breeding	2500	2	micro scale
32	Point	Prince Onyi Igboamazu	8035988120	umuawulu wd1	Awka south	7.111	6.097	Concrete	breeding	3000	2	micro scale

(0 out of 80 Selected)

Fig 11 Attribute table results of query builder by pond types and operation.

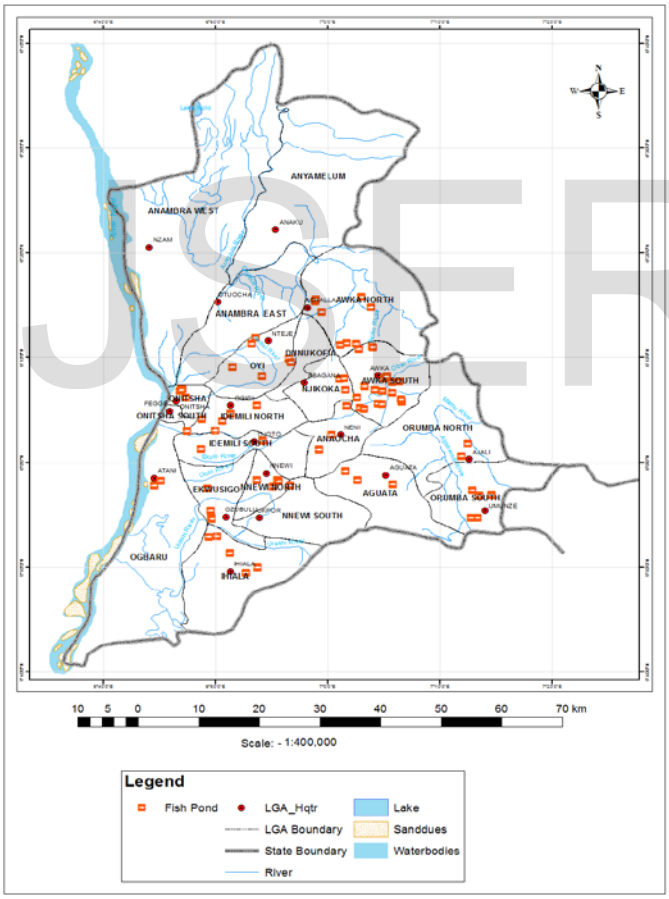


Fig 12: Map showing query results by pond types and operation.

Fig.10 shows the query builder of two entities namely pond types and operations. Fig 11 shows the attribute results of query builder by pond types and operation. Fig 12 shows the Map of the query results by pond types and operation.

4.5 Query 5 (Pond types, Population and Operation less than or equal to 5000.)

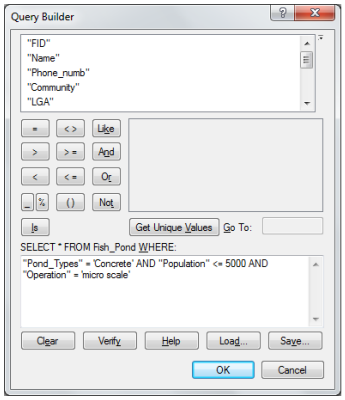
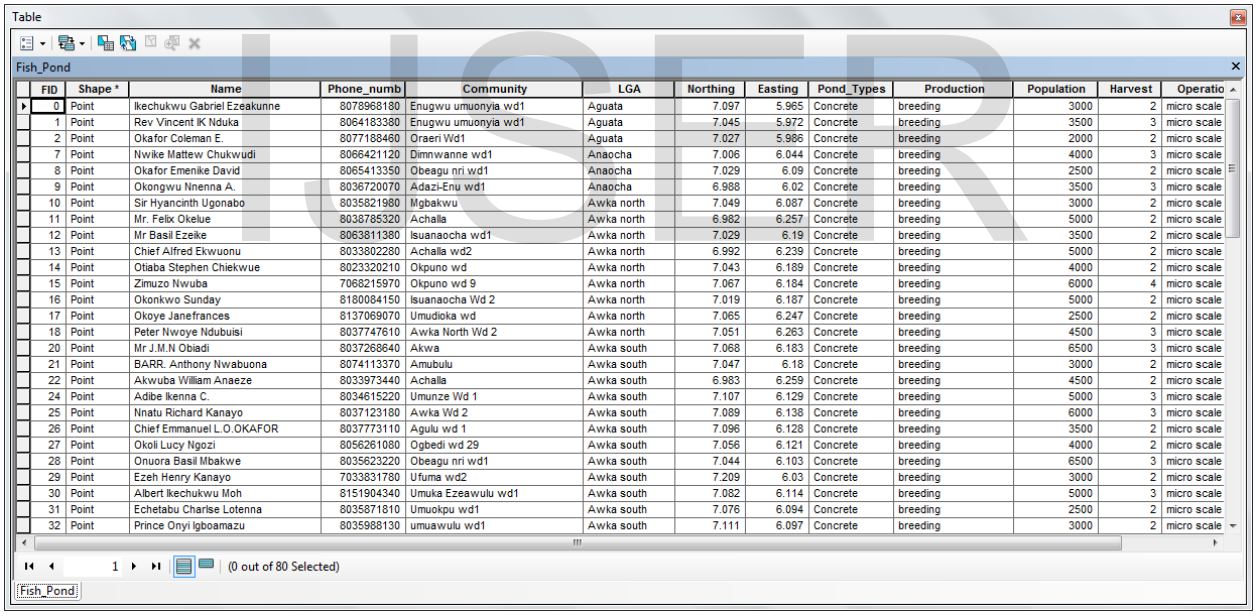


Fig 13: Query builder by Pond types, Population and Operation less than or equal to 5000.



Table

Fish_Pond

FID	Shape *	Name	Phone_numb	Community	LGA	Northing	Easting	Pond_Types	Production	Population	Harvest	Operatio
0	Point	Ikechukwu Gabriel Ezeakunne	8078968180	Enugwu umuonyia wd1	Aguata	7.097	5.965	Concrete	breeding	3000	2	micro scale
1	Point	Rev Vincent IK Nduka	8064183380	Enugwu umuonyia wd1	Aguata	7.045	5.972	Concrete	breeding	3500	3	micro scale
2	Point	Okafor Coleman E.	8077188460	Oraeri Wd1	Aguata	7.027	5.986	Concrete	breeding	2000	2	micro scale
7	Point	Nwike Mattew Chukwudi	8066421120	Dimnwanne wd1	Anaocha	7.006	6.044	Concrete	breeding	4000	3	micro scale
8	Point	Okafor Emenike David	8065413350	Obeagu nri wd1	Anaocha	7.029	6.09	Concrete	breeding	2500	2	micro scale
9	Point	Okongwu Nnenna A.	8036720070	Adazi-Enu wd1	Anaocha	6.988	6.02	Concrete	breeding	3500	3	micro scale
10	Point	Sir Hyancinth Ugonabo	8035821980	Mgbakwu	Awka north	7.049	6.087	Concrete	breeding	3000	2	micro scale
11	Point	Mr. Felix Okelue	8038785320	Achalla	Awka north	6.982	6.257	Concrete	breeding	5000	2	micro scale
12	Point	Mr Basil Ezeike	8063811380	Isuanaocha wd1	Awka north	7.029	6.19	Concrete	breeding	3500	2	micro scale
13	Point	Chief Alfred Ekwuonu	8033802280	Achalla wd2	Awka north	6.992	6.239	Concrete	breeding	5000	2	micro scale
14	Point	Otiaba Stephen Chiekwue	8023320210	Okpuno wd	Awka north	7.043	6.189	Concrete	breeding	4000	2	micro scale
15	Point	Zimuzo Nwuba	7068215970	Okpuno wd 9	Awka north	7.067	6.184	Concrete	breeding	6000	4	micro scale
16	Point	Okonkwo Sunday	8180084150	Isuanaocha Wd 2	Awka north	7.019	6.187	Concrete	breeding	5000	2	micro scale
17	Point	Okoye Janefrances	8137069070	Umudioka wd	Awka north	7.065	6.247	Concrete	breeding	2500	2	micro scale
18	Point	Peter Nwoye Ndubuisi	8037747610	Awka North Wd 2	Awka north	7.051	6.263	Concrete	breeding	4500	3	micro scale
20	Point	Mr J.M.N Obiadi	8037268640	Akwa	Awka south	7.068	6.183	Concrete	breeding	6500	3	micro scale
21	Point	BARR. Anthony Nwabuona	8074113370	Amubulu	Awka south	7.047	6.18	Concrete	breeding	3000	2	micro scale
22	Point	Akwuba William Anaeze	8033973440	Achalla	Awka south	6.983	6.259	Concrete	breeding	4500	2	micro scale
24	Point	Adibe Ikenna C.	8034615220	Umunze Wd 1	Awka south	7.107	6.129	Concrete	breeding	5000	3	micro scale
25	Point	Nnatu Richard Kanayo	8037123180	Awka Wd 2	Awka south	7.089	6.138	Concrete	breeding	6000	3	micro scale
26	Point	Chief Emmanuel L.O.OKAFOR	8037773110	Agulu wd 1	Awka south	7.096	6.128	Concrete	breeding	3500	2	micro scale
27	Point	Okoli Lucy Ngozi	8056261080	Ogbedi wd 29	Awka south	7.056	6.121	Concrete	breeding	4000	2	micro scale
28	Point	Onuora Basil Mbakwe	8035623220	Obeagu nri wd1	Awka south	7.044	6.103	Concrete	breeding	6500	3	micro scale
29	Point	Ezeh Henry Kanayo	7033831780	Ufuma wd2	Awka south	7.209	6.03	Concrete	breeding	3000	2	micro scale
30	Point	Albert Ikechukwu Moh	8151904340	Umuka Ezeawulu wd1	Awka south	7.082	6.114	Concrete	breeding	5000	3	micro scale
31	Point	Echetabu Charlse Lotenna	8035871810	Umuokpu wd1	Awka south	7.076	6.094	Concrete	breeding	2500	2	micro scale
32	Point	Prince Onyi Igboamazu	8035988130	umuawulu wd1	Awka south	7.111	6.097	Concrete	breeding	3000	2	micro scale

1 (0 out of 80 Selected)

Fish_Pond

Fig 14: Attribute table results of query builder by pond types, operation and population less than or equal to 5000.

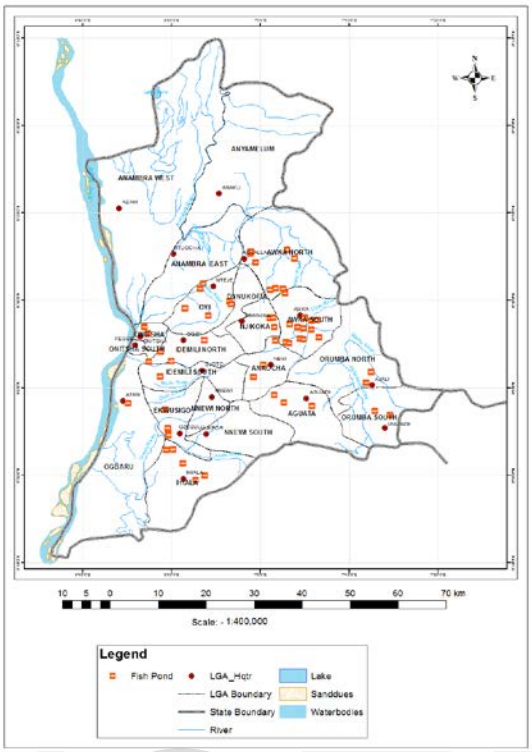


Fig 15: Map showing query results by pond types, operations and populations less than or equal to 5000.

Fig.13 shows the query builder by pond types, population and operations. This is a query command to show pond types, population and operations less than or equal to 5000. This results shows the fish farms that uses concrete fish pond with its operations and population not above 5000. Fig 14 shows the attribute table results of the query builder. Fig.15 shows the Map of the query results by pond type, population and operations.

5.0 Research Findings

The significance of the results depicted in some of the analyses and information are very exciting. These findings would be extremely important as it reveals issues and appraisal for the fish farms.

a) The distributions of fish farms in Anambra state cluster mainly in Awka north and Awka south where as in Anambra west, Ayamelum, Ogbaru , Nnewi south, Aguata and Orumba north the distribution is scanty Hence more fish farms should be established to serve the general population within the study area.

b) There are few fish farm managers with the technical knowhow involved in fish farming

c) There is no policy framework on fish farming in Anambra state. Hence the state government should develop a policy framework to avert mismanagement of human and material resources.

d) Some of the fish farms are faced with the challenges of insufficient funds which make them not to be fully functional.

e) Those ponds located near the river suffer a great loss because of flood.

f) Insufficient power supply affects the fish farms in the area of water supply from the borehole.

g) There is a wide gap between fish production and demand in the state.

6.0 Conclusion

GIS produces a series of qualitative and quantitative reference maps which may lead to the formulation of more advanced and sophisticated studies. It could serves as a strategic and operational decision support tool for implementation of fishery management regulation. This will enable integration of management objectives with spatial data and improve the mapping for the development and management of fisheries

7.0 Recommendation

a) This study will serve as a decision support system in management of fish farms in Anambra state.

b) Seminars, workshop should be organized to sensitized fish farm managers on the technical knowhow involve in fish farming.

c) More fish farms should be established to serve the general population within the study area.

d) Government should create enabling environment to encourage potential investors in fish farms in Anambra state.

Reference

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[2] Hernandez, M. J. (2012): Database Design for Mere Mortals: A Hands- on Guide to Rotational Database Design. 3rd Edition. Pearson Education, Indianapolis, Indiana. Pp 15, 22 and 31.

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