

Brief report on slaughterhouse waste management in Ecuador

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ABSTRACT

In the present paper, the spatial distribution of the slaughterhouses and the slaughterhouse waste management practices in Ecuador are reported. Percentage distribution of slaughterhouses in different regions is presented.

Keywords: slaughterhouse, Ecuador, waste management

Introduction

Slaughterhouse waste is interpreted as industrial waste in the category of agricultural and food industries. Waste waters from slaughterhouses and meat processing industries are classified by Environmental Protection Agency (EPA) as one of the most harmful to the environment [1]. For the treatment of the slaughterhouse waste, the conventional biological processes do not provide the solution to satisfy environmental requirements. In the practice, the anaerobic process is particularly applied to effluents discharged at high concentrations of COD and other biodegradable [2] components. Some investigators had utilised different types of anaerobic processes [3], in which wastes were passed upward through a blanket of concentrated anaerobic biological solids [4,5]. In the present study the spatial distribution of the slaughterhouses and the

slaughterhouse waste management practices in Ecuador are reported.

Report

In Ecuador more than 200 registered slaughterhouses were reported in 2017. The slaughterhouses are regulated by the law: LEY DE MATADEROS N° 502 - C LA H. JUNTA MILITAR DE GOBIERNO. The 45% of them is located in the highland region (Sierra), 38% is located in the coast region (Costa) and 17% is in the Amazon and Galapagos regions (Fig. 1). Most of them are owned and managed by the municipalities (Table 1); 81% of the slaughterhouses is located in urban areas, 7% is located in semi-urban areas and 12% is located in rural areas. In the country, 522,638 slaughtered cattle were reported in 2012. Calculating an approximate production of 105,430 metric tons of meat end up into the sewers. In any case, the apparent per-capita availability does not exceed 9 kg / ha / year [6-11].

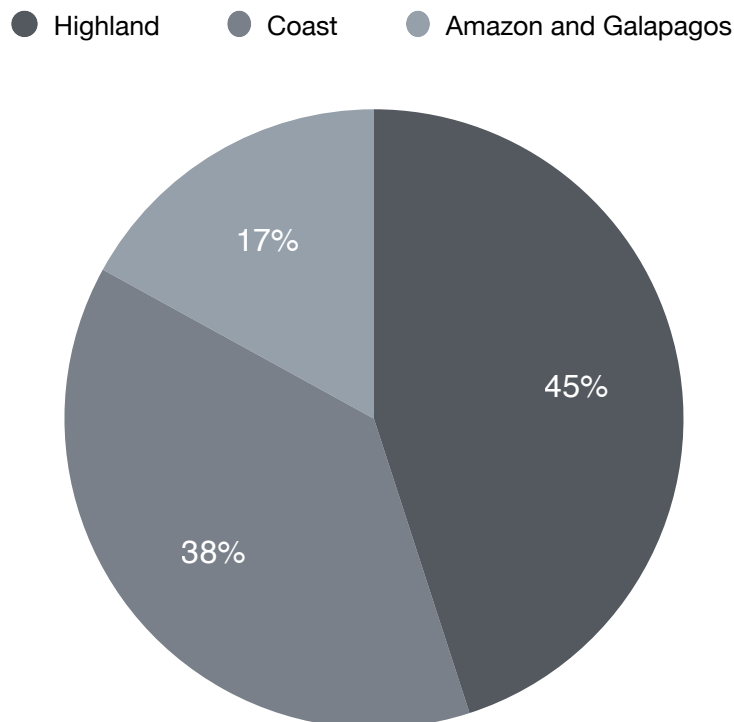


Figure 1. Percentage distribution of slaughterhouses in the different regions

In Ecuador considerable attention is paid to the sustainable development [12-16]. Thanks to that alternative treatment methods appeared in the practice:

Composting is an aerobic process in which organic materials are degraded by the activities of aerobic microorganisms [17]. There are many different substrates used in the practice, and can include different types of organic and inorganic wastes, sewage sludge, pig, cattle or poultry manure, garden waste and municipal solid waste. The benefits of composts on arable soil have been reported by many authors [18,19]

AH is a relatively new technology that is utilised in Ecuador for the disposal of animal carcass material, and other infectious wastes [20,21]. In the process sodium or potassium hydroxide are used to catalyze the hydrolysis of biological materials (such as proteins, nucleic acids, carbohydrates, lipids, etc.) into a

sterile aqueous solution consisting of small peptides, amino acids, sugars, and soaps. To accelerate the hydrolysis, the process is usually conducted with pressure and temperature. For the inactivation of microbial pathogens, carcasses are heated to 100°C and are pressurized at 103 kpa for 3 h. To destroy prion containing material, carcasses are heated to 150°C and are pressurized at 486 kpa for 6–8 h [22].

AD is a biological process in which organic wastes are degraded in the absence of oxygen, producing a sludge of agricultural value, as well as biogas [23,24]. In recent years, AD technology has been utilised commercially in Ecuador in the treatment of farm, industrial, and municipal wastes. AD also represents an alternative method for the disposal of animal carcasses and slaughterhouse wastes, with the dual benefits of both eliminating waste material and producing energy [25,26].

Table 1. List of the slaughterhouses under official inspection [27]

Province	Canton	Parish	Name of the slaughterhouse
AZUAY	GUALACEO	GUALACEO	MATADERO DEL GAD MUNICIPAL DE GUALACEO
AZUAY	PAUTE	VIA CHICHIC	MATADERO DEL GAD MUNICIPAL DE PAUTE
AZUAY	CUENCA	YANUNCAY	MATADERO AVICOLAS CEDILLO
BOLÍVAR	GUARANDA	VEINTIMILLA	PELADORA ARTESANAL "LA GRANJA"
CAÑAR	CAÑAR	CAÑAR	MATADERO MUNICIPAL DE CAÑAR
CAÑAR	LA TRONCAL	LA TRONCAL	MATADERO MUNICIPAL DE LA TRONCAL
CAÑAR	AZOGUES	SAN MIGUEL	MATADERO ARTESANAL LOS MASHIS
CAÑAR	AZOGUES	BORRERO	FAENADORA CALLE CANTOS.
CAÑAR	AZOGUES	AZOGUES	MATADERO ARTESANAL LAS MARÍAS
CAÑAR	AZOGUES	AZOGUES	MATADERO ARTESANAL LOS TULOS
CAÑAR	LA TRONCAL	LA TRONCAL	MATADERO DE POLLOS SAN ANDRES
CARCHI	TULCÁN	URBINA	MATADEROS DE TULCÁN
CARCHI	MONTUFAR	SAN GABRIEL	MATADERO DE MONTUFAR
COTOPAXI	LATACUNGA	JUAN MONTALVO	CAMAL MUNICIPAL DE LATACUNGA
COTOPAXI	SAQUISILI	SAQUISILI	CAMAL TECNOLÓGICO SAQUISILI
COTOPAXI	SALCEDO	SAN MIGUEL	CAMAL MUNICIPAL DE SALCEDO
COTOPAXI	LA MANA	PUCAYACU	CAMAL PUCAYACU

COTOPAXI	PANGUA	EL CORAZON	CAMAL EL CORAZON
COTOPAXI	LATACUNGA	ELOY ALFARO	CAMAL ECARNI S.A
COTOPAXI	LATACUNGA	TANICUCHI	FAENADORA DE AVES INCUBANDINA
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA FAENAMIENTO DON MARCO
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA FAENAMIENTO PROAVEC
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA FAENAMIENTO PILARCITA
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA FAENAMIENTO LA CASA DEL POLLO
COTOPAXI	LATACUNGA	ELOY ALFARO	MATADERO MARLITO
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA DE FAENAMIENTO EL SABOR CRIOLLO DE SEGUNDO RODRÍGUEZ
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA DE FAENAMIENTO ANDY
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA DE FAENAMIENTO NEGRITA
COTOPAXI	LATACUNGA	POALÓ	MATADERO NAYELI DE LUIS HUMBERTO TANDALIA
COTOPAXI	LATACUNGA	ELOY ALFARO	FAENADORA DE POLLOS EL OSITO
COTOPAXI	LATACUNGA	ELOY ALFARO	FAENADORA EL MEJOR POLLO (V&R)
COTOPAXI	LATACUNGA	POALÓ	PLANTA FAENAMIENTO PRIMERO LA DELICIA CANDO MYRIAM
COTOPAXI	LATACUNGA	POALÓ	PLANTA FAENAMIENTO ARTESANAL RICO POLLO LUZ CANDO
COTOPAXI	LATACUNGA	ELOY ALFARO	FAENADORA DE AVES ANGEL
COTOPAXI	LATACUNGA	ELOY ALFARO	FAENADORA SUPER POLLO
COTOPAXI	LATACUNGA	ELOY ALFARO	PLANTA FAENAMIENTO MEGAPOLLO
COTOPAXI	SALCEDO	SAN MIGUEL	FAENADORA PECHUGON (MARIA SALOME)
COTOPAXI	LATACUNGA	ELOY ALFARO	MARCELITO
COTOPAXI	LATACUNGA	IGNACIO FLORES	FAENADORA DE POLLO OLGUITA
COTOPAXI	LATACUNGA	IGNACIO FLORES	ARIELITO
COTOPAXI	SALCEDO	SAN MIGUEL	FAENADORA MARÍA MEDINA
COTOPAXI	LATACUNGA	ELOY ALFARO	FAENADORA EL SABROSON (ABATA NORMA)
COTOPAXI	LATACUNGA	ELOY ALFARO	AVECAR
COTOPAXI	LATACUNGA	POALÓ	(LA DELICIA) DELI POLLO
COTOPAXI	LATACUNGA	IGNACIO FLORES	(ANA BEATRIZ MASAPANTA YUNGAN) SUPER POLLO BACHITA
COTOPAXI	PUJILI	PUJILI	POLLO CAMPERO
COTOPAXI	PUJILI	PUJILI	POLLOS PUJILI
COTOPAXI	SAQUISILI	SAQUISILI	AVICOLA ELIZABETH
COTOPAXI	LATACUNGA	ELOY ALFARO	POLLOS PATTY (ZAPATA HERRERA NELLY PATRICIA)
COTOPAXI	SIGCHOS	SIGCHOS	FAENADORA GRANJA
COTOPAXI	PUJILI	PUJILI	FAENADORA JIMENEZ
COTOPAXI	SALCEDO	SAN MIGUEL	PROCESADORA SANTA ANITA
COTOPAXI	LATACUNGA	IGNACIO FLORES	CENTRO DE FAENAMIENTO ARTESANAL DE AVES M & S
COTOPAXI	LATACUNGA	LA MATRIZ	FAENADORA BALSECA
COTOPAXI	LATACUNGA	LA MATRIZ	FAENADORA DONOSO
COTOPAXI	PUJILI	PUJILI	POLLOS DOÑA BACHITA

COTOPAXI	PUJILI	PUJILI	FAENADORA POLLOS REINA DE AGUA SANTA (CHICAIZA)
COTOPAXI	SALCEDO	SAN MIGUEL	FAENADORA GUTIERREZ
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO MUNICIPAL DEL CANTÓN RIOBAMBA
CHIMBORAZO	COLTA	CAJABAMBA	MATADERO MUNICIPAL DEL CANTÓN COLTA
CHIMBORAZO	CHUNCHI	MATRIZ	MATADERO NUNICIPAL DEL CANTÓN CHUNCHI
CHIMBORAZO	ALAUSI	MATRIZ	MATADERO MUNICIPAL DEL CANTÓN ALAUSI
CHIMBORAZO	PALLATANGA	MATRIZ	MATADERO MUNICIPAL DEL CANTÓN PALLATANGA
CHIMBORAZO	CHAMBO	MATRIZ	MATADERO INDUSTRIAS HERMAYAR
CHIMBORAZO	RIOBAMBA	MALDONADO	POLLOS NAHO SUR
CHIMBORAZO	RIOBAMBA	LZARZABURU	MATADERO MAXI POLLOS
CHIMBORAZO	RIOBAMBA	LICAN	MATADERO SAN FRANCISCO
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO POLLO EL PECHUGON
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO EL PECHUGON 2
CHIMBORAZO	RIOBAMBA	LIZARZABURU	MATADERO POLLOS LA CAROLINA
CHIMBORAZO	RIOBAMBA	LIZARZABURU	MATADERO MILY
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO POLLOS CARLITA MANYA
CHIMBORAZO	COLTA	CAJABAMBA	MATADERO REY POLLO
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO NUEVO AMANCER
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO JOSELITO
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO REINA DEL CISNE
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO ELIZITA
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO DANIELITA
CHIMBORAZO	RIOBAMBA	LIZARZABURU	MATADERO DE POLLOS NICOL
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO MI FAVORITO
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO POLLO SUPERIOR
CHIMBORAZO	GUAMOTE	MATRIZ	MATADERO MARÍA ISABEL
CHIMBORAZO	RIOBAMBA	LIZARZABURU	MATADERO SUPER POLLO
CHIMBORAZO	CHUNCHI	MATRIZ	MATADERO ORMAZA
CHIMBORAZO	RIOBAMBA	VELOZ	MATADERO POLLO EL REY

CHIMBORAZO	CHUNCHI	MATRIZ	MATADERO OJEDA
CHIMBORAZO	RIOBAMBA	MALDONADO	MATADERO POLLO MARI
CHIMBORAZO	ALAUSI	SIBAMBE	MATADERO IBARRA
CHIMBORAZO	ALAUSI	SIBAMBE	MATADERO BERRONES
EL ORO	ATAHUALPA	PACCHA	CAMAL MUNICIPAL DE ATAHUALPA
EL ORO	ARENILLAS	ARENILLAS	CAMAL MUNICIPAL DE ARENILLAS
EL ORO	MARCABELÍ	MARCABELÍ	CAMAL MUNICIPAL DE MARCABELÍ
EL ORO	PASAJE	PASAJE	CAMAL MUNICIPAL DE PASAJE
EL ORO	STA. ROSA	PTO. JELI	CAMAL MUNICIPAL DE STA. ROSA
EL ORO	PIÑAS	PIÑAS	CAMAL MUNICIPAL DE PIÑAS
EL ORO	PIÑAS	PIÑAS	CAMAL PRIVADO AURO APOLO
EL ORO	BALSAS	BALSAS	MATADERO AVICOLA PRIVADO DE ASAVIOR
EL ORO	STA. ROSA	TORATA	MATADERO AVICOLA PRIVADO ARTESANAL FRANKLIM LUNA "OROPOLLO"
EL ORO	MACHALA	LA PRIMAVERA	MATADERO AVICOLA PRIVADO LUIS ÁNGEL LEÓN TACURI "SU POLLERÍA"
EL ORO	BALSAS	BALSAS	MATADERO AVICOLA PRIVADO ARTESANAL JAVIER APOLO "JAVIPOLLOS"
GUAYAS	BUCAY	BUCAY	PROCESADORA NACIONAL DE ALIMENTOS C.A.
GUAYAS	GUAYAQUIL	CHONGON	CAMAL PRIVADO AVICOLA FERNANDEZ
GUAYAS	GUAYAQUIL	CHONGON	CAMAL PRIVADO FERNANDEZ
GUAYAS	BALAO	BALAO	CAMAL MUNICIPAL DE BALAO
GUAYAS	MILAGRO	MILAGRO	CAMAL PRIVADO JIMENEZ
GUAYAS	ISIDRO AYORA	ISIDRO AYORA	Avícola SAN ISIDRO S.A. AVISID (CAMAL CERDOS)
GUAYAS	ISIDRO AYORA	ISIDRO AYORA	Avícola SAN ISIDRO S.A. AVISID (AVES)
GUAYAS	GUAYAQUIL	CHONGON	AVICOLA LIRIS
GUAYAS	GUAYAQUIL	TARQUI	VALKATISA S.A.
GUAYAS	GUAYAQUIL	TARQUI	FAENADORA INTERNACIONAL DE AVES FAINASA
GUAYAS	GUAYAQUIL	TARQUI	CEN TRO DE FAENAMIENTO DE AVES DE CORRAL CORNEJO
GUAYAS	GUAYAQUIL	TARQUI	PEREIRA CASTRO CARLOS LUIS
GUAYAS	GUAYAQUIL	XIMENA	REY POLLO
IMBABURA	IBARRA	SAN FRANCISCO	REPROAVI
IMBABURA	ANTONIO ANTE	SANTO DOMINGO	FAENAVI
LOJA	CATAMAYO	CATAMAYO	EMPRESA PUBLICA DE RASTRO CATAMAYO
LOJA	LOJA	EL VALLE	CAFRILOSA
LOJA	LOJA	EL VALLE	POLLO LOJANO
LOJA	GONZANAMA	LANZACA	POLLO LANZACA
LOS RÍOS	BABAHOYO	CAMILO PONCE	AREA DE FAENAMIENTO DE ANIMALES DE ABASTO
LOS RÍOS	MONTALVO	MONTALVO	MATADERO MUNICIPAL DEL CANTON MONTALVO
MANABI	PAJAN	PAJÁN	MATADERO MUNICIPAL PAJÁN

MORONA SANTIAGO	SANTIAGO	MENDEZ	INDUSTRIA CARNICA DE MORONA SANTIAGO INDUSCARMOS C.E.M
MORONA SANTIAGO	LIMON INDANZA	GENERAL PLAZA	CAMAL MUNICIPAL DE LIMON INDANZA
MORONA SANTIAGO	SUCUA	HUAMBI	EMPRESA PUBLICA MUNICIPAL DE FAENAMIENTO INDUSTRIALIZACIÓN Y COMERCIALIZACIÓN DE GANADO, PRODUCTOS Y SUBPRODUCTOS O DERIVADOS DEL GOBIERNO AUTONOMO DEL CANTON SUCUA
MORONA SANTIAGO	MORONA	RIO BLANCO	FAENADORA ARTESANAL DE AVES " AUCAY "
MORONA SANTIAGO	MORONA	PROAÑO	FAENADORA ARTESANAL DE AVES " ALVACORA "
NAPO	TENA	TENA	CAMAL MUNICIPAL DE TENA (CEFATE C.E.M)
PASTAZA	PASTAZA	PUYO	PELADORA DE POLLOS FÁTIMA
PASTAZA	MERA	SHELL	C.F.A.A. "POLLOS FORTACHON"
PASTAZA	MERA	SHELL	C.F.A.A. "EL PROGRESO"
PASTAZA	MERA	SHELL	C.F.A.A. "EL BUEN POLLO"
PASTAZA	PASTAZA	PUYO	C.F.A.A. "CLARA LOPEZ"
PASTAZA	PASTAZA	PUYO	PELADORA DE POLLOS "SAN JORGE "
PASTAZA	PASTAZA	PUYO	C.F.A.A. "BACHITA"
PASTAZA	MERA	MADRE TIERRA	C.F.A.A S/N (FABIAN VILLAROEL)
PICHINCHA	QUITO	CHILLOGALLO	EMPRESA PUBLICA METROPOLITANA DE RASTRO QUITO
PICHINCHA	CAYAMBE	CAYAMBE	CENTRO DE FAENAMIENTO MUNICIPAL DEL CANTON CAYAMBE
PICHINCHA	QUITO	CARAPUNGO	MATADERO Y CARNES FRIAS MACAFRI CIA LTDA
PICHINCHA	QUITO	YARUQUI	INTEGRACIÓN AVICOLA ORO CIA LTDA
PICHINCHA	QUITO	PINTAG	AVÍCOLA VITALOA S.A. AVITALSA
PICHINCHA	QUITO	POMASQUI	POLLO FAVORITO S.A. POFASA
PICHINCHA	QUITO	CHECA	PROCESADORA NACIONAL DE ALIMENTOS C.A. PRONACA
PICHINCHA	QUITO	PIFO	LA PRADERA
TUNGURAHU A	BAÑOS	BAÑOS	MATADERO MUNICIPAL BAÑOS DE AGUA SANTA
TUNGURAHU A	QUERO	QUERO	CENTRO DE FAENAMIENTO OCAÑA CIA.LTDA
TUNGURAHU A	PELILEO	PELILEO	CAMAL MUNICIPAL PELILEO
TUNGURAHU A	AMBATO	IZAMBA	MATADERO FRIGORIFICO MUNICIPAL AMBATO
TUNGURAHU A	QUERO	YANAYACU	CENTRO DE FAENAMIENTO MONTERREY
TUNGURAHU A	TISALEO	TISALEO	CENTRO DE FAENAMIENTO E.T.
TUNGURAHU A	PELILEO	PELILEO	PATRICIA DEL PINO "EL POLLAZO"
TUNGURAHU A	PILLARO	CIUDAD NUEVA	GLADYS RODRIGUEZ "POLLOS EL PLACER"
TUNGURAHU A	BAÑOS	BAÑOS	IVAN CHAVEZ "POLLOS PURA PECHUGA"
TUNGURAHU A	AMBATO	IZAMBA	POLLOS CRIOLLO

TUNGURAHU A	PATATE	PATATE	POLLOS SAN AGUSTIN
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS "POLLOS GABY"
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS "POLLOS ALEXITO"
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS POLLOS LADY
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS VERÓNICA JÍNEZ M&J
TUNGURAHU A	PELILEO	BENITEZ	FENADORA ARTESANAL DE POLLOS DEYSI GARCES
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS MERY MIRANDA
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA DE POLLOS SUPER POLLO
TUNGURAHU A	PELILEO	BENITEZ	FAENADORA ARTESANAL DE POLLOS WILSON VILLEGAS
TUNGURAHU A	AMBATO	IZAMBA	FAENADORA ARTESANAL DE POLLOS "LAS KARNES"
TUNGURAHU A	PILLARO	PRESIDENTE URBINA	FAENADORA ARTESANAL DE POLLOS "POLLOS PECHUGONES"
TUNGURAHU A	BAÑOS	RIO NEGRO	FAENADORA ARTESANAL DE POLLOS "JOHAN & IZAN"
ZAMORA CHINCHIPE	YANTZAZA	YANTZAZA	MATADERO MUNICIPAL DE YANTZAZA
SUCUMBIOS	CASCALES	DORADO CASCALES	CAMAL MUNICIPAL DE CASCALES
SUCUMBIOS	PUTUMAYO	PUERTO EL CARMEN	CAMAL MUNICIPAL PUTUMAYO
SUCUMBIOS	LAGO AGRIO	NUEVA LOJA	AVICOLA RAPIVISA
SUCUMBIOS	SHUSHUFINDI	SHUSHUFINDI	CAMAL MUNICIPAL SHUSHUFINDI
SUCUMBIOS	LAGO AGRIO	NUEVA LOJA	MATADERO ARTESANAL DE AVES - VALENTINA
SUCUMBIOS	LAGO AGRIO	NUEVA LOJA	MATADERO ARTESANAL DE AVES - SAN JOSÉ
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	VALLE HERMOSO	PRONACA MATADERO AVES
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	VALLE HERMOSO	PRONACA MATADERO CERDOS
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	SANTO DOMINGO	EMPRESA PÚBLICA MUNICIPAL DE RASTRO Y PLAZAS DE GANADO DE SANTO DOMINGO
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	LUZ DE AMERICA	AGROPESA
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	NUEVO ISRAEL	IPOCA S.A.

SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	SANTO DOMINGO	LUIS BATALLAS
SANTO DOMINGO DE LOS TSACHILAS	SANTO DOMINGO	NUEVO ISRAEL	VELASCO LUIS
STA. ELENA	SANTA ELENA	SANTA ELENA	CAMAL MEGAPIEDRA
STA. ELENA	SANTA ELENA	SANTA ELENA	FAENADORA DE POLLOS COSTA
STA. ELENA	LA LIBERTAD	LA LIBERTAD	FAENADORA DE POLLOS AMANDITA

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