



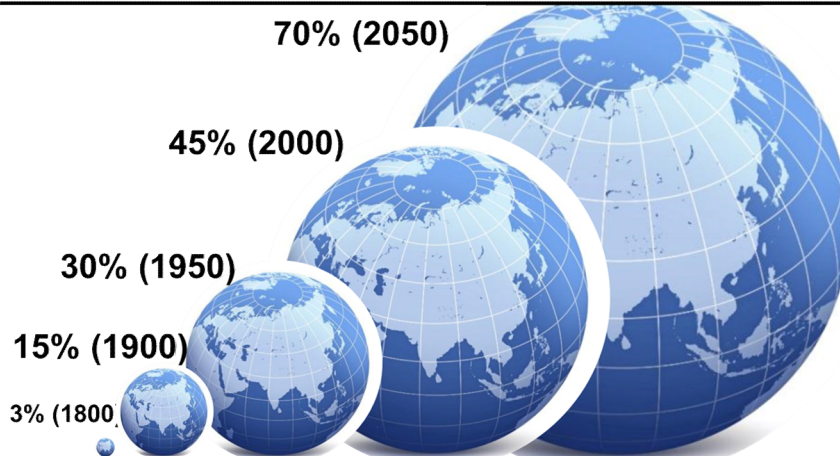
Diversification of agroproductive systems in the Ecuadorian Amazon Region (RAE)



Dr. Reinaldo Demesio Alemán Pérez. PhD

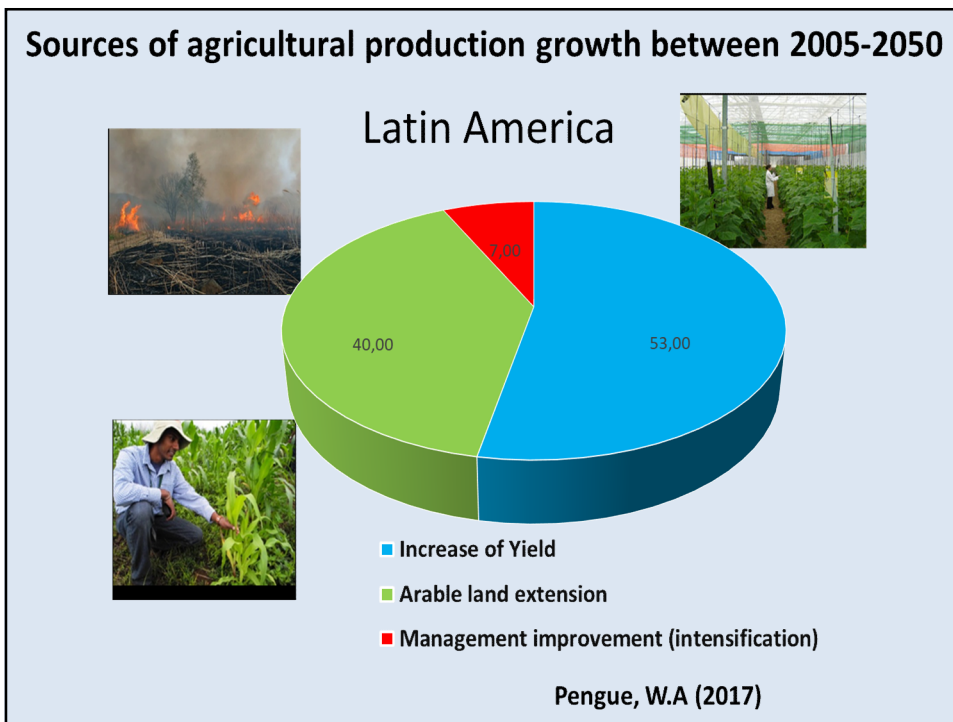
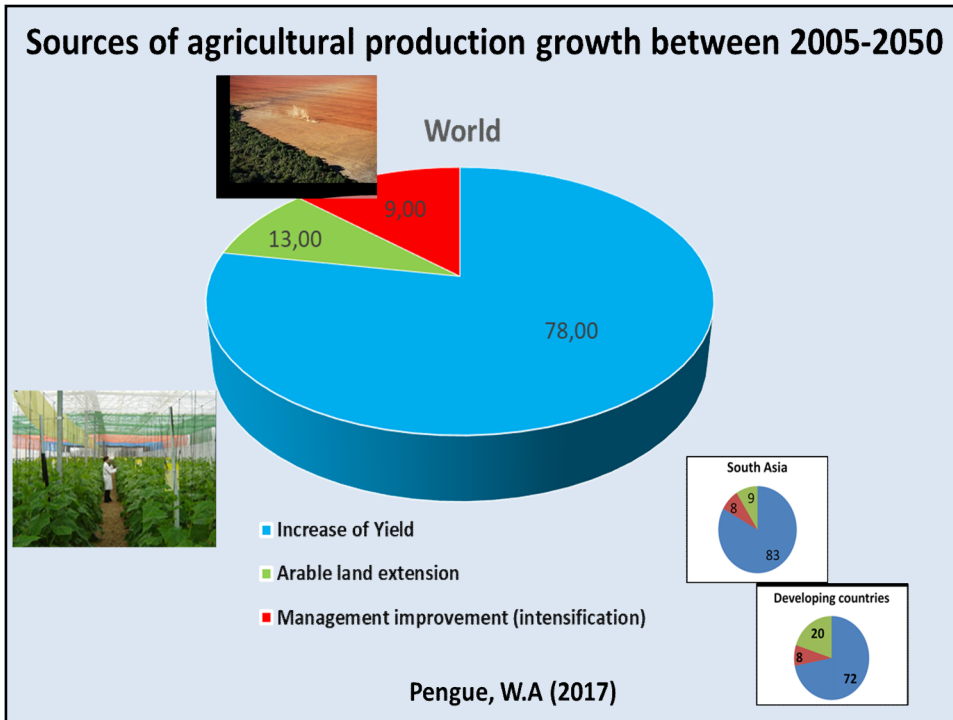
E mail: reinaldoap@gmail.com

In our generation we face the Second Wave of Urbanization.....



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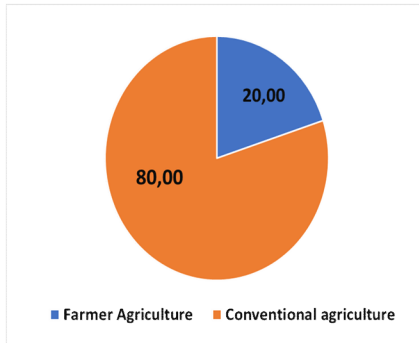
(UN DESA, 2012)



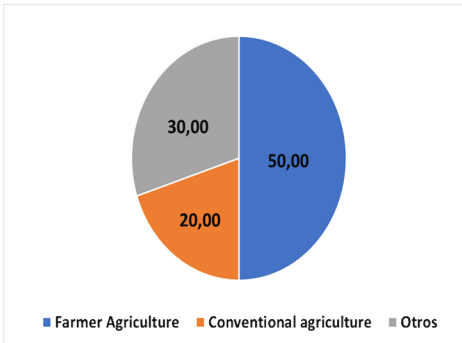
Analysis of modern agriculture: consequences and challenges

Why Fortify of farmer agriculture?

Occupation of arable land in the world



Food production in the world



Current situation in the Amazon region



40 MILLION INHABITANTS
• 385 INDIGENOUS AND TRIBAL PEOPLES,
• 86 LANGUAGES, 650 DIALECTS



Approximately- 6 MILLION Km²
LARGEST FOREST SURFACE OF
THE PLANET



LARGEST MEGADIVERSE REGION OF THE
PLANET
- 40,000 plant species



15% ALL FRESH WATER OF THE PLANET
COMES FROM THE BASIN AMAZON





- The RAE has more than 700,000 inhabitants that constitutes 3.9% of the national total (INEC, 2010).
- The indigenous population comprises 30% of the regional total.


Nationalities

- Kichwa.
- Shuar.
- Achuar.
- Wuaorani.

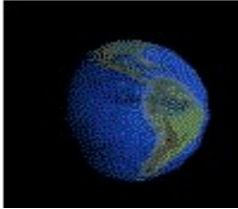
- Secoya.
- Shiwiar.
- Andoa.
- Zápara.
- Cofán.


With different cultural patterns and languages

Macropblems in the Amazon




Deforestation







Monoculture




Mining



Oil Extraction



Pollution



Diseases and insalubry



Dirección de Investigación
Educación académica de primer nivel, para formar profesionales y líderes de la más alta calidad



• Most of the activities are incompatible with the preservation and sustainable management of the forest



Invaluable losses of biodiversity.



IMPACTS ARE IRREVERSIBLE IF YOU DO NOT ACT TIMELY

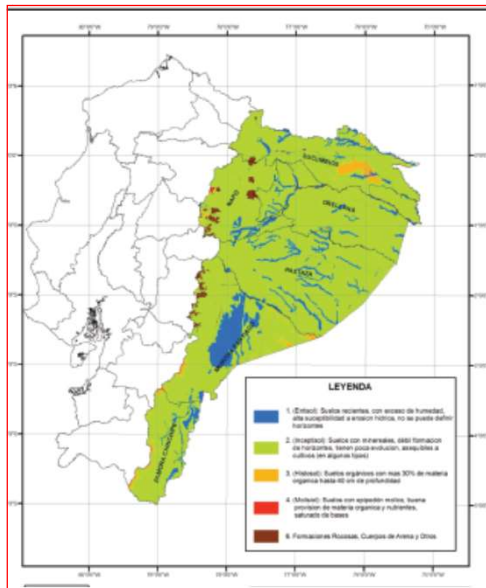
CLIMATE CHARACTERISTICS OF THE ECUADORIAN AMAZON REGION

Agroecological Areas			
Climatic parameters	Low jungle 265-580 msnm	High Jungle 628-960 msnm	Eyebrow of Jungle 1615-3150 msnm
Rainfall (mm)	2140 a 5019	1981 a 6134	1712 a 2666
Temperature °C	23,4 a 25,4	21,1 a 22,9	10.1 a 14,1
Relative Humidity %	86 a 88	88	88 a 92



Fuente : Nieto y Caicedo 2012

SOIL CHARACTERISTICS

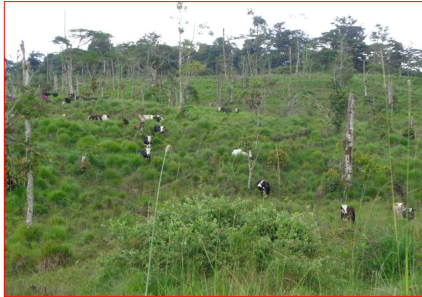


INSEPTISOLS 80 %
 ENTISOLS
 HISTOSOLS
 -ANDISOLS
 -MOLISOLS

- Limitations**
- Low fertility (P, Ca, Mg, K)
 - Acid pH
 - Water excess
 - Aluminum toxicity
 - Steep slopes
 - Fragile soils

Fuente : Nieto y Caicedo 2012

Advance of the Agricultural Frontier



The diversity of species grown in the RAE is very low

Systems traditionalist of production

- Sugar cane.
- Chinese potato.
- Banana.
- Pasturas.
- Cocoa.
- Naranjilla and other fruit trees with low yields



“Alternatives or strategies for Agroecological management in the context of the Ecuadorian Amazon Region”

Diversification of productive systems

Soil ecological management

Organic Manure production

Polyculture

Biological controls of pests and diseases

Organic Manure Production



PILAS EXPERIMENTALES COMPOST

PILA 3 (PRODUCTORES)

Composición		Dimensiones (metros)		Volteo	Taper
Materia Prima	%	Longitud	Anchura	Frecuencia	Descripción
Cal	=0	2	2	1	Semanal (Los miércoles) Taper inicialmente con plástico por 15 días. Después tapar con lona por 15 días.
Gallinaza	10.34%	2	2	1	
Mielaza	=0	1.5	1.5	1	
Resto verde	13.79%				
Restos Vegetales	13.79%				
Estiercol	13.79%				
Hojas seca	10.34%				
Cal	=0				
Tierra	10.34%				
Restos Vegetales	13.79%				
Gallinaza	13.79%				

Peso total: _____

PILAS EXPERIMENTALES COMPOST

PILA 2 (VENCEDORES)

Composición		Dimensiones (m)		Volteo	Taper
Materia Prima	%	Longitud	Anchura	Frecuencia	Descripción
Gallinaza	9.81%	3	3	1	Primer volteo se realizará a los 15 días y luego se realizará un volteo cada 15 días y medio según la temperatura simple a disminuir y para continuar los volteos se realizará cada 15 días.
Restos Vegetales	9.81%	2	2	1	
Aserrín	9.81%	1.5	1.5	1	
Caliza picada	11.17%				
Pollinaza	14.81%				
Herbaja picada	14.81%				
Restos Vegetales	14.81%				
Aserrín	14.81%				

Peso total: _____

Proyecto: "Fortalecimiento de la Universidad Estatal Amaluza en la implementación de tecnologías apropiadas para el tratamiento y aprovechamiento productivo y de desarrollo social con residuos orgánicos en Pastaza"

Con apoyo de:

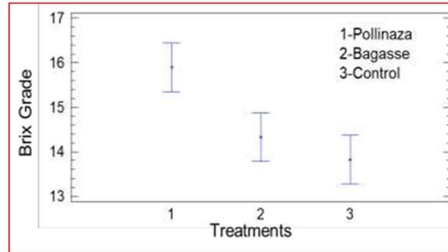
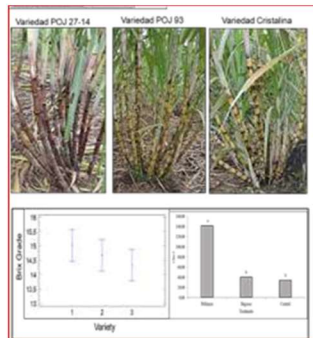
Diversified systems in the cultivation of sugarcane



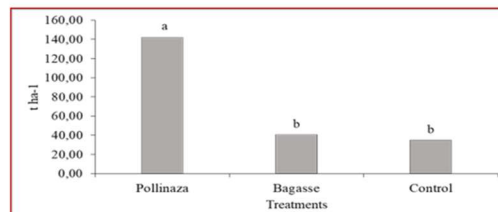
Sugarcane



Sugarcane cultivation behavior vs. organic fertilization



Brix grades in sugar cane according to organic fertilization 300 days after planting. Simon Bolivar-Pastaza Parish. (Tuckey $p < 0.05$)



Alemán et al (2017c)

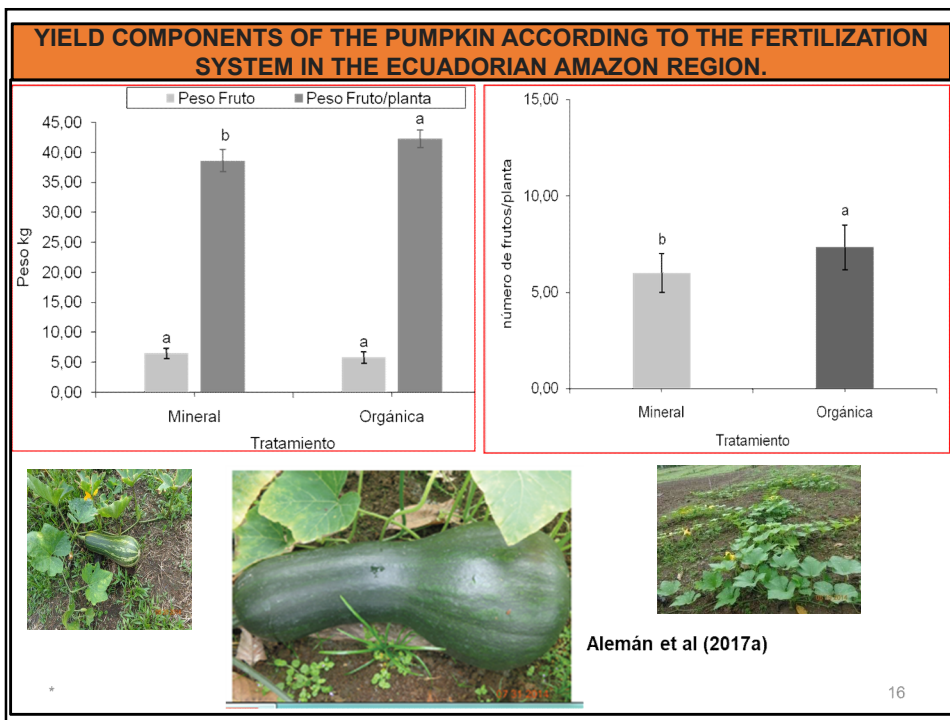
Yield in $t\ ha^{-1}$ depending on the fertilization treatment, Simon Bolívar-Pastaza.

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Alternative agro-ecological management

Vegetable Diversification







PRODUCTION BY PLANT AND AGRICULTURAL YIELD IN TOMATO VARIETIES UNDER ORGANIC PRODUCTION IN THE ECUADORIAN AMAZON REGION.		
VARIETY	PRODUCTION (kg/planta)	AGRICULTURAL YIELD (kg/ha)
MIRAMAR	4,65 a	162 885 a
SYTA	3,23 b	113 064 a
LOCAL	2,40 b	84 027 b

Aleján et al. (2016)



YIELD COMPONENTS AND AGRICULTURAL YIELD OF DE TOMATO VARIEDAD SYTA ACCORDING TO PRODUCTION SYSTEMS IN THE ECUADORIAN AMAZON REGION.				
Treatments	Number of fruits per cluster	Number of fruits per plant	Average fruit weight (g)	Agricultural yield (kg/ha)
Chemical	4,04	24,25 b	172,56 b	129 920
Agroecological	4,40	26,43 a	217,31 a	178 340
Organic	4,56	27,36 a	236,87 a	205 156

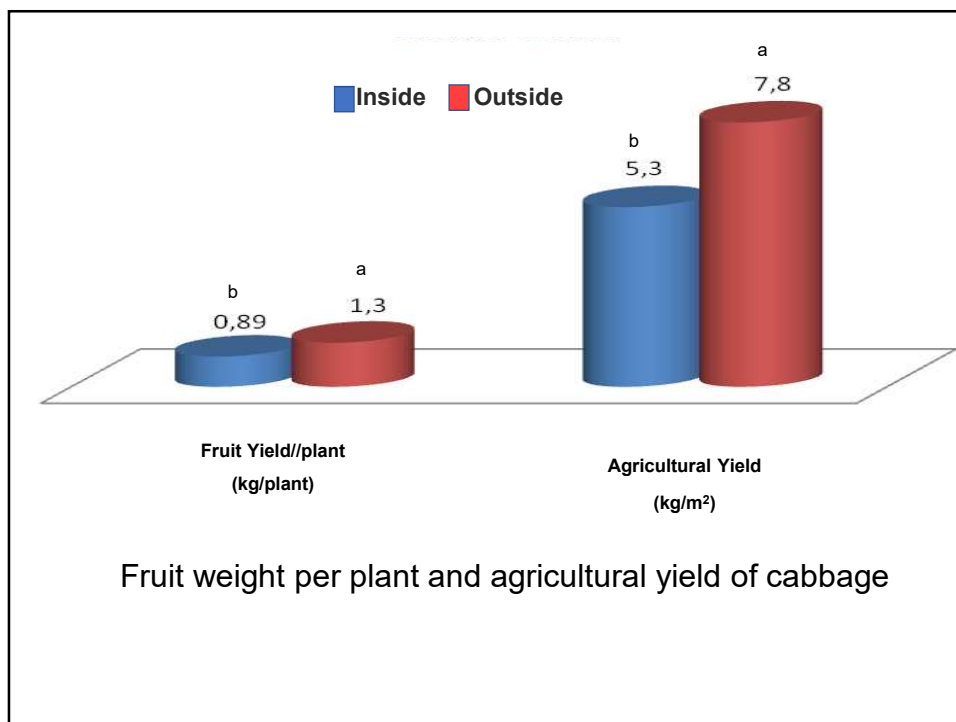



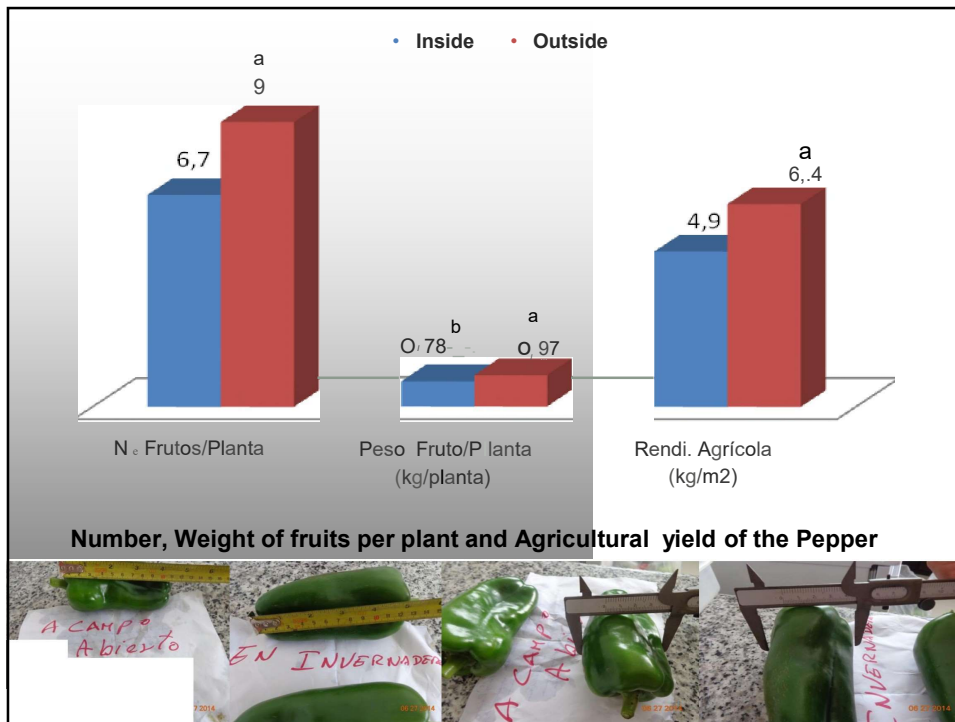
Aleján et al. (2016)

Average values of the leaf area and index of leaf area of the Claudia cabbage inside and outside the greenhouse

Treatments	Leaf Area (m ²)		Leaf Area Index (m ²)	
	25 ddt	72 ddt	25 ddt	72 ddt
Greenhouse	0,26a	1,18 a	0,83 a	3,69a
Outside	0,12b	0,90b	0,37 b	2,83b





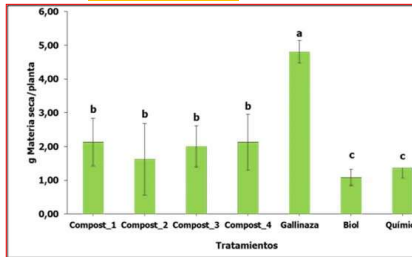
Productive indicators in pumpkin, cucumber, melon and watermelon.

Crop	Number of fruits per plant	Peso promedio de frutos (Kg)	Fruit weight per plant (kg)	Yield per plot (Kg)	Agricultural yield (t/ha)
Pumpkin	6	5,3	31,8	159,0	63,6
Cucumber	15	0,31	4,65	27,9	11,2
Melon	0	0	0	0	0
Watermelon	2	0,53	1,06	6,36	2,5

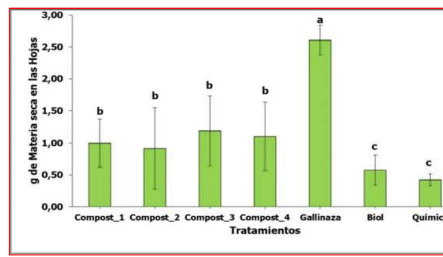


Lettuce Cultivation behavior vs type of fertilization.

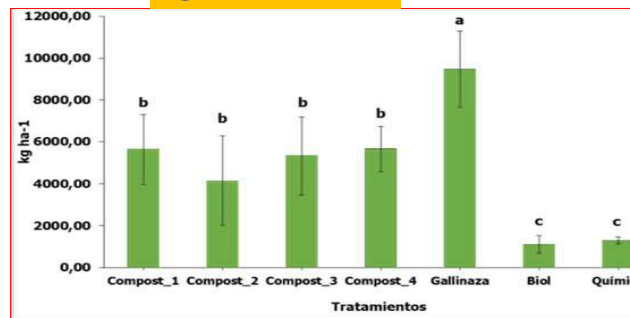
Biological Yield



Económico Yield



Agricultural Yield



Agroforestry Cocoa



Cocoa-plantain banana intercropping



Coffee





Number of individual species, their yield and profit per year in the farms						
Crop	Production per area (Kg/Ha)	No. of plants	Production per plant (Kg)	Total production (Kg)	Market price (USD/Kg)	Profit in USD
Cacao	562	125	0.9	112.5	2.07	232
Coffee	1274	277	2.03	564	1.52	858
Banana	6000	78	12	936	0.33	308
Corn	-	1780	1 Mazorca	1500 Maz	0.25/Maz	375 x 2 = 750
Yuca	19 110	520	8	4160	0.33	1372
Calabaza	-	24	6	144	2 usd / fruits	288
Water melon	-	36	5	180	1.5 usd / fruits	270
Pepino	-	32	9	288	0.25 usd / fruto	72
Chilli	-	140	0.5	70	1.0	70
Maracuyá	-	50	15 fruits / plant	750	0.25 usd / fruto	187
Guanábana	-	4	25 fruits / plant	100	2 usd / fruits	200
Sugar cane	-	28	14 tallos / plantón	392	0.5 usd / tallo	196
Tomato	-	130	40 tomato / plant	5200	5 cent usd / tomato	260

Number of individual species, their yield and profit per year in the farms. (Cont.)						
Crop	Production per area (Kg/Ha)	No. of plants	Production per plant (Kg)	Total production (Kg)	Market price (USD/Kg)	Profit in USD
Papa	-	180	83 kg / plant	666	0.33	219
Guaba	-	3	400 vainas / plant	1200 vainas	0.25 / vaina	300
Naranjilla		25				
Orange		4				
Mandarina		4				
Sacha Inchi		25				
Mango		4				
Achotillo		4				
Flor de Jamaica		9				
Hierba Luisa		8				
23 Especies		3 490 plant				5 582

Main species of fruit trees, bushes and palms that store carbon and are used for consumption in Chakras with cacao in the Sumaco Biosphere Reserve, 2012									
Scientific name	Family	Common name		Use					
		Kichwa	Spanish	Comestible	Medicinal	Spiritual	Craft	Drink	Material
<i>Bixa orellana</i> L.	Bixaceae	Puka manturu	Achiote	x	x		x		x
<i>Theobroma bicolor</i> Humb. & Bonpl.	Sterculiaceae	Patas yura	Cacao blanco	x	x				
<i>Grias neuberthii</i> J.F. Macbr	Lecythidaceae	Pitun	Pitón	x	x				x
<i>Ilex guayusa</i> Loes	Aquifoliaceae	Waysa	Guayusa		x	x			x
<i>Sanago racemosum</i> (Ruiz & Pav.) Barringer	Grossulariaceae	Chiri waysa	Panka grande		x	x			
<i>Gustavia macarenensis</i> Philipson.	Lecythidaceae	Pasu	Paso	x	x				x
<i>Gustavia longuifolia</i> Poepp. ex O. Berg									
<i>Pouteria caimito</i> Radlk.	Sapotaceae	Tarpu aviyu	Caimito	x	x				x
<i>Micropholis melinoniana</i> Pierre	Sapotaceae	Aviyu	Caimitillo	x	x				x
<i>Micropholis venulosa</i> Pierre									
<i>Artocarpus altilis</i> (Parkinson) Fosberg	Moraceae	Paparawa	Frutipan	x	x				x
<i>Brugmansia arborea</i> (L.) Lagerh	Solanaceae	Wantuk	Floripondio		x	x			
<i>Persea americana</i> Mill.	Lauraceae	Palta yura	Aguacate	x	x				x
<i>Bactris gasipaes</i> Kunth	Arecaceae	Chunta	Chonta duro	x	x		x	x	
<i>Mauritia flexuosa</i> L.f.	Arecaceae	Muriti	Morete	x	x	x	x	x	
<i>Iriartea deltoidea</i> Ruiz & Pav.	Arecaceae	Pushiwa	Pambil	x	x		x		x
<i>Inga edulis</i> Mart.	Fabaceae	Pakay	Guaba de bejuco	x	x				x
<i>Pouroma</i> spp.	Urticaceae	Pikuanka	Uva del monte	x					x
<i>Annona cherimola</i> Mill.	Annonaceae	Chirimoya	Chirimoya	x	x				x
<i>Psidum guajava</i> L.	Myrtaceae	Guayaba	Guayaba	x	x				x

Source: Torres *et al.* 2014

Main arboreal species of commercial interest in the Chakra, Napo 2015		
Species	Family	Local Name
<i>Cordia alliodora</i> (Ruiz and Pav.) Oken	Boraginaceae	Laurel
<i>Cedrela odorata</i> L.	Meliaceae	Cedro
<i>Cedrelinga cateniformis</i> (Ducke) Ducke	Mimosaceae	Seike, chuncho
<i>Ceiba samauma</i> (Mart.) K. Schum.	Bombacaceae	Ceibo
<i>Myroxylon balsamum</i> (L.) Harms	Fabaceae	Bálsamo
<i>Cabralea canjerana</i> (Vell.) Mart.	Meliaceae	Batea caspi
<i>Capirona decorticans</i> Spruce	Rubiaceae	Capirona
<i>Minquartia guianensis</i> Aubl.	Olacaceae	Guayacán
<i>Tabebuia chrysantha</i> (Jacq.) G. Nicholson	Bignoniaceae	Guayacán
<i>Nectandra cissiflora</i> Nees	Lauraceae	Canelo amarillo
<i>Ocotea amazónica</i> (Meisn.) Mez		
<i>Swietenia macrophylla</i> King	Meliaceae	Caoba
<i>Clusia ducoides</i> Engl.	Clusiaceae	Pungara
<i>Vochysia biloba</i> Ducke	Vochysiaceae	Tamburo
<i>Gustavia macarenensis</i> Philipson	Lecythidaceae	Paso
<i>Pollalesta discolor</i> (Kunth) Aristeguieta	Asteraceae	Pigüe
<i>Terminalia Amazonia</i> (J.F.Gmel) Exell	Combretaceae	Roble Yumbingue
<i>Otoba parvifolia</i> (Markgr.) A.H. Gentry	Myristicaceae	Sangre de Gallina
<i>Caryodendron orinocense</i> H. Karst.	Euphorbiaceae	Maní de árbol

Fuente: Torres *et al.*, 2015

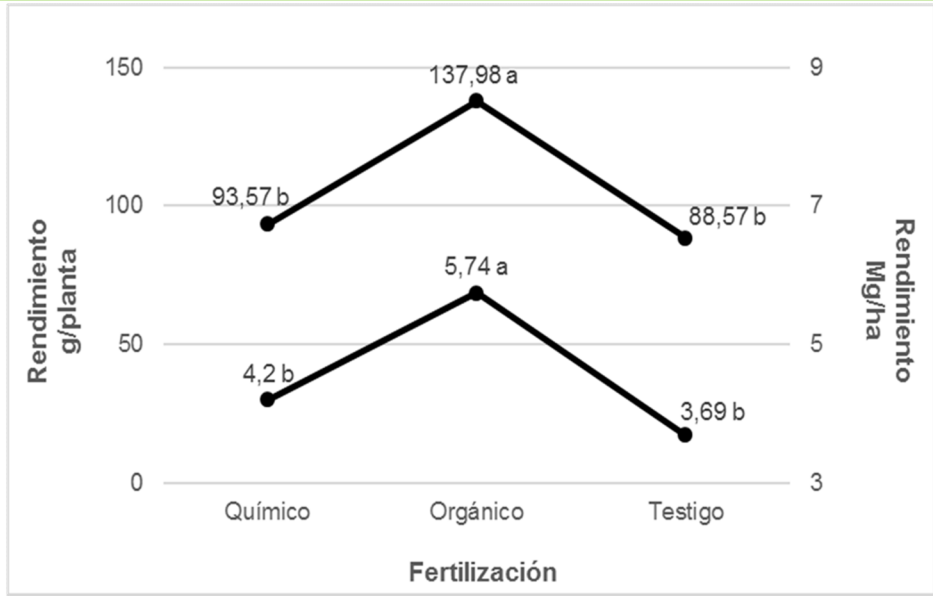
Colocasia esculenta (L.) Schott



Colocasia esculenta (L.) Industrialization in Pastaza, Ecuadorian Amazon Region



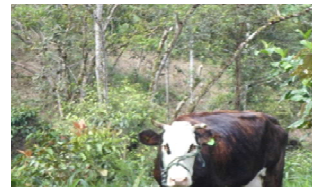
Effect of chemical and organic fertilization on the yield of a local variety of maize (Tusilla)- Ecuadorian Amazon Region



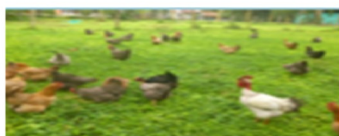
Livestock production systems



Livestock production systems



Evaluation and contribution to the rescue of the biodiversity of native breeds in the Ecuadorian Amazon region



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Creole chicken production in the Ecuadorian Amazon Region



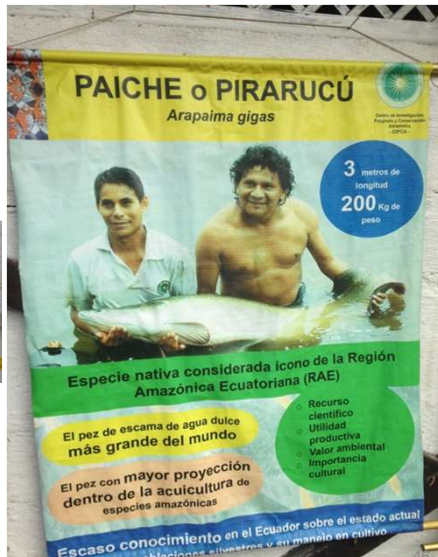
Andrade et al (2017)

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“Adaptation in captivity of Amazonian ichthyofauna with focus on Arapaima gigas (paiche) for aquaculture and conservation purposes”



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Seed production



Seed Conservation



Food conservation in the CHAKRA

