FOOD SECURITY POTENTIALS OF AGROFORESTRY SYSTEMS IN SELECTED UPLAND FARMING COMMUNITIES IN THE PHILIPPINES

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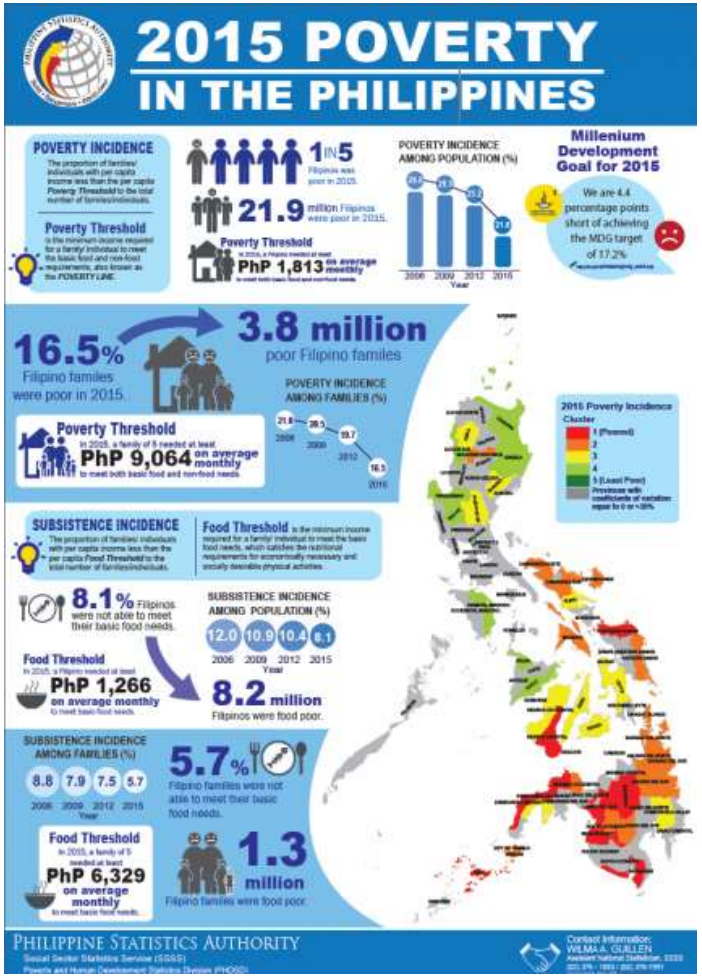
Current issues related to food security

https://ourworldindata.org/



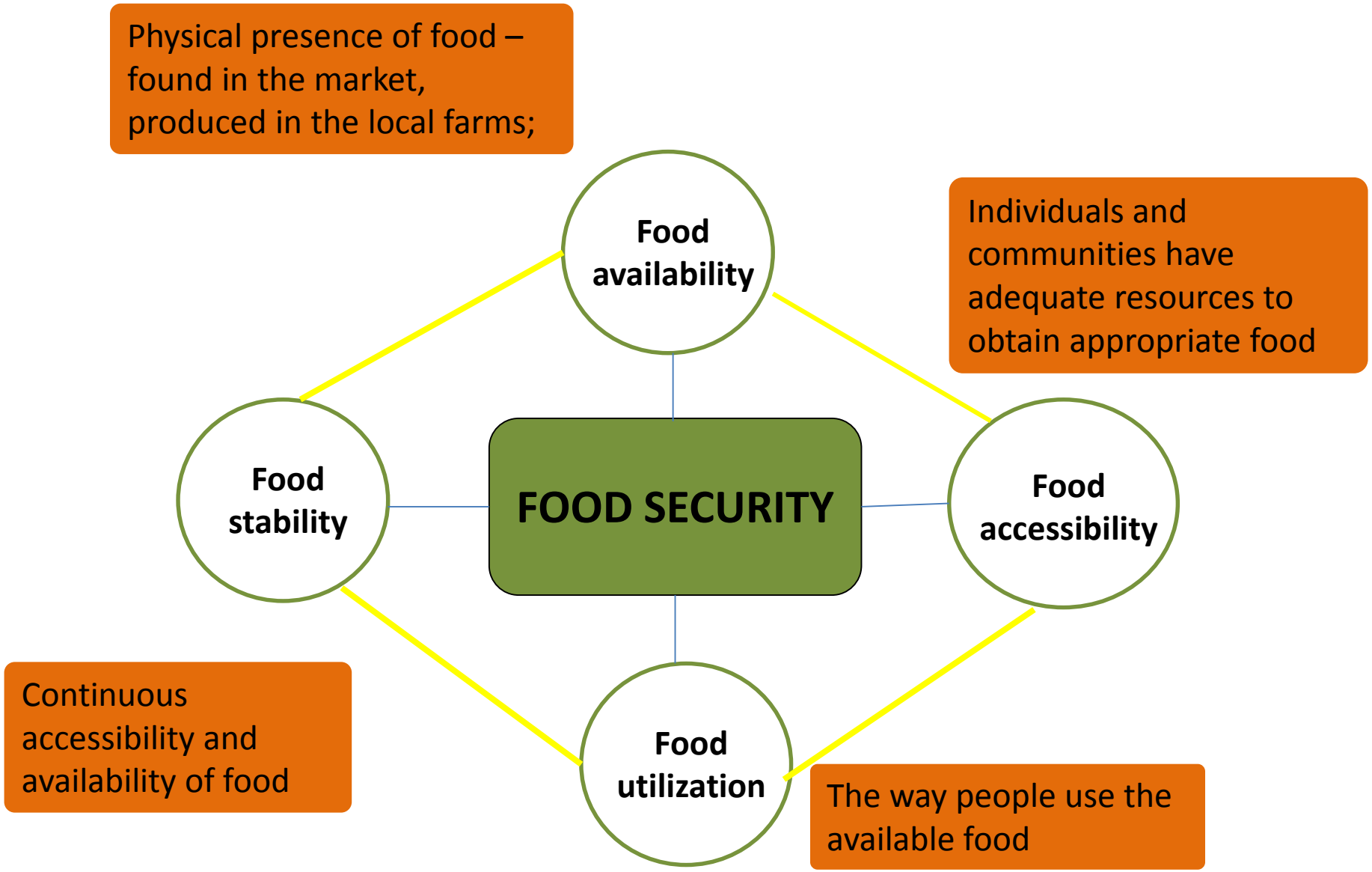
https://psa.gov.ph/poverty-press-releases/data

Current issues related to food security

Declining agricultural productivity

Understanding food security…

- ***Food security*** is a situation that exists when all people, at all times have physical, social and economic ***access*** to ***sufficient***, ***safe*** and ***nutritious*** food that meets their ***dietary needs*** and ***food preferences*** for an active and healthy life (FAO, 2011)

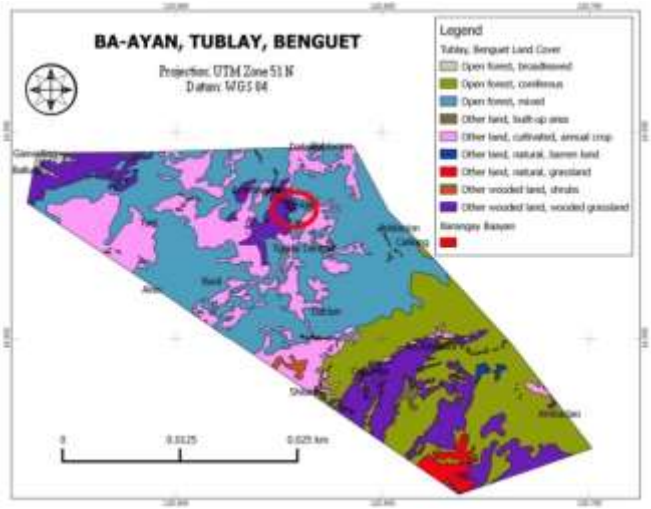

Physical presence of food – found in the market, produced in the local farms;
Food availability
Individuals and communities have adequate resources to obtain appropriate food
Food stability
FOOD SECURITY
Food accessibility
Continuous accessibility and availability of food
Food utilization
The way people use the available food

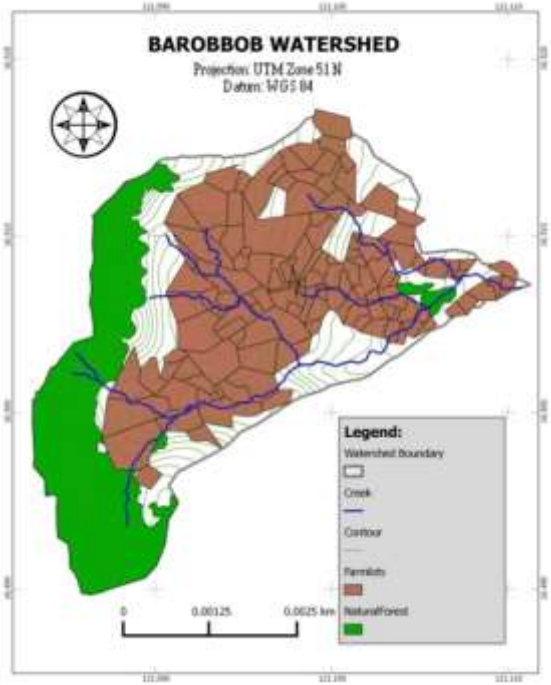
IFRC, 2014

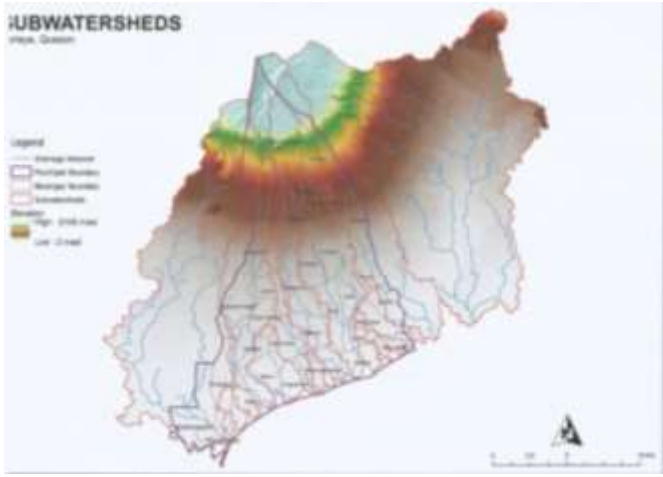
Why this research?

- **Can the farmer-producers consume their own produce?**
- **Is food available and accessible among the farmer-producers?**
- **Can the production systems produce food enough for the farmer-producer's household and the community?**
- **Can these agricultural production systems withstand or cope with natural calamities?**

STUDY SITES


BA-AYAN, TUBLAY, BENGUET
Projection: UTM Zone 51 N
Datum: WGS 84
Legend
Tublay, Benguet Land Cover
Open forest, broadleaved
Open forest, coniferous
Open forest, mixed
Other land, built-up area
Other land, cultivated, annual crop
Other land, natural, barren land
Other land, natural, grassland
Other wooded land, shrubs
Other wooded land, wooded grassland
Barangay Basyan


BAROBBOB WATERSHED
Projection: UTM Zone 51 N
Datum: WGS 84
Legend:
Watershed Boundary
Creek
Contour
Farmlots
NaturalForest
0
0.00125
0.0025 km


UBWATERSHEDS

METHODOLOGY

- **Semi-structured interviews and focus group discussions for socioeconomic, biophysical characterization and food security analysis**
- **Characterization of the agricultural production activities via farm visits**
- **Food security analysis**
  - *Food availability*
  - *Food accessibility*
  - *Food stability*
  - *Food utilization*

METHODOLOGY

INDICATORS OF FOOD SECURITY	MEASURES	QUANTITATIVE AND ADJECTIVAL RATINGS
Food availability	• Level of availability (always available; sometimes; not available) • Eating frequency of the household per day • Experiences of food shortage • Experiences of skipping meals and hunger • Sources of basic food needs	1.50 – 2.00 (food is highly available) 1.00 – 1.49 (food is moderately available) <1.00 (food is not available)

METHODOLOGY

INDICATORS OF FOOD SECURITY	MEASURES	QUANTITATIVE AND ADJECTIVAL RATINGS
Food accessibility	• Whether farm produce are used for home consumption • Whether the households can buy food items in the market that are not available in their farms • Whether the household are able to meet their basic food needs	1.50 – 2.00 (food is highly accessible) 1.00 – 1.49 (food is moderately accessible) <1.00 (food is not accessible)

METHODOLOGY

INDICATORS OF FOOD SECURITY	MEASURES	QUANTITATIVE AND ADJECTIVAL RATINGS
Food stability	• Whether farming system produce multiple crops throughout the year • Whether crop components could withstand or cope with typhoons, drought, pests and diseases	1.50 – 2.00 (food is highly stable) 1.00 – 1.49 (food is moderately stable) <1.00 (food is not stable)

METHODOLOGY

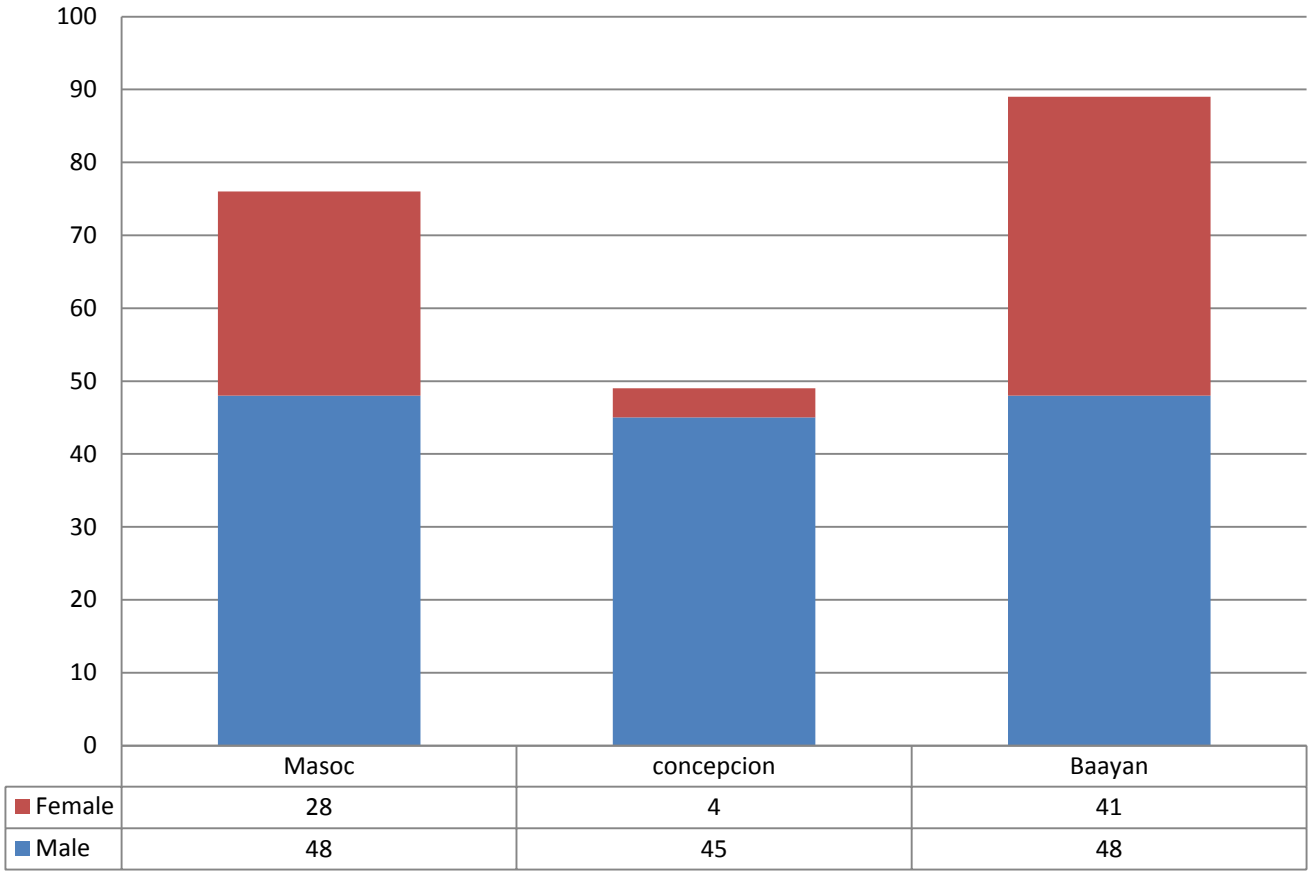
INDICATORS OF FOOD SECURITY	MEASURES	QUANTITATIVE AND ADJECTIVAL RATINGS
Food utilization	• Whether farmers consume their own produce • Whether the produce are utilized by other members of the local communities and those outside the community • Kind of food items that are being utilized by the household	1.50 – 2.00 (food is highly utilized) 1.00 – 1.49 (food is moderately utilized) <1.00 (food is not utilized)

METHODOLOGY

INDICATORS OF FOOD SECURITY	MEASURES	QUANTITATIVE AND ADJECTIVAL RATINGS
Food Security Score	Sum of scores of the four measures	7.00 – 8.00 (High level of food security) 6.00 – 6.99 (Moderate level of food security) 5.00 – 5.99 (Low level of food security) <5.00 (Food insecure)


RESULTS

Socioeconomic Profile

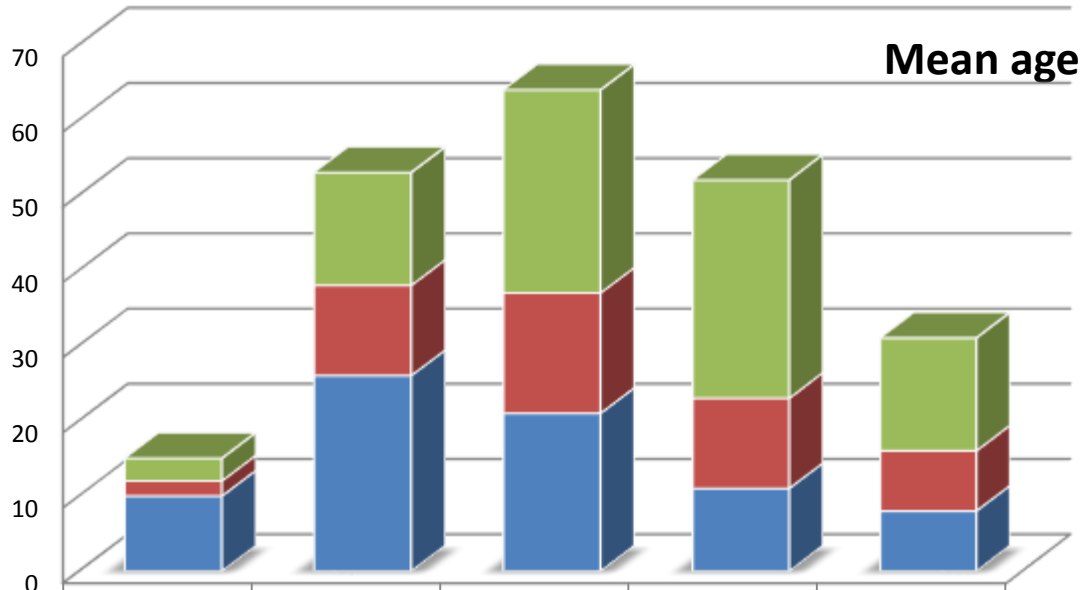


	Masoc	concepcion	Baayan
Female	28	4	41
Male	48	45	48

63%-M
37%-F

Distribution of upland farmers by sex (n=215)

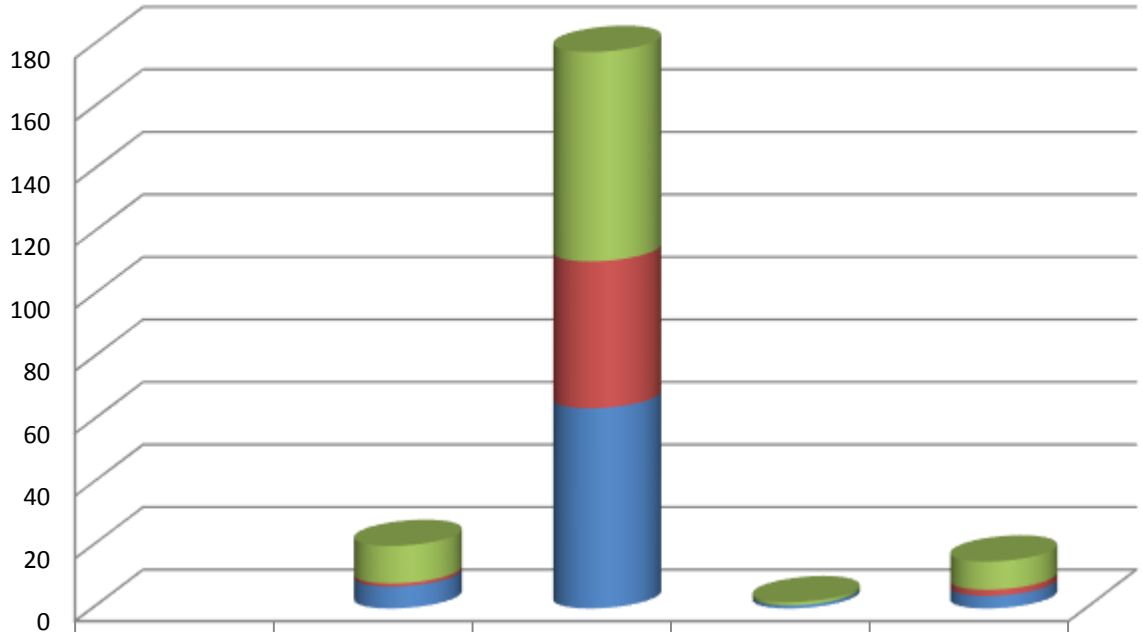
Socioeconomic Profile



	<30	31-40	41-50	51-60	>60
Baayan	3	15	27	29	15
concepcion	2	12	16	12	8
Masoc	10	26	21	11	8

Distribution of upland farmers by age

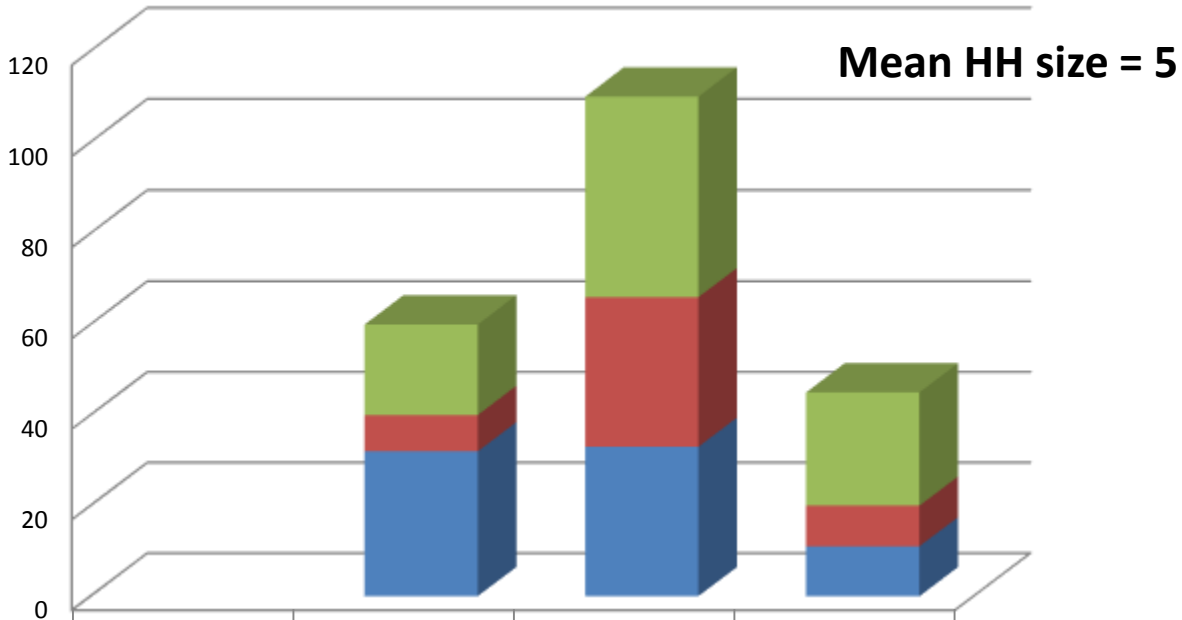
Socioeconomic Profile



		Single	Married	Separated	Wido
Baayan		12	67	1	9
Concepcion		1	47	0	2
Masoc		7	64	1	4

Distribution of upland farmers by civil status

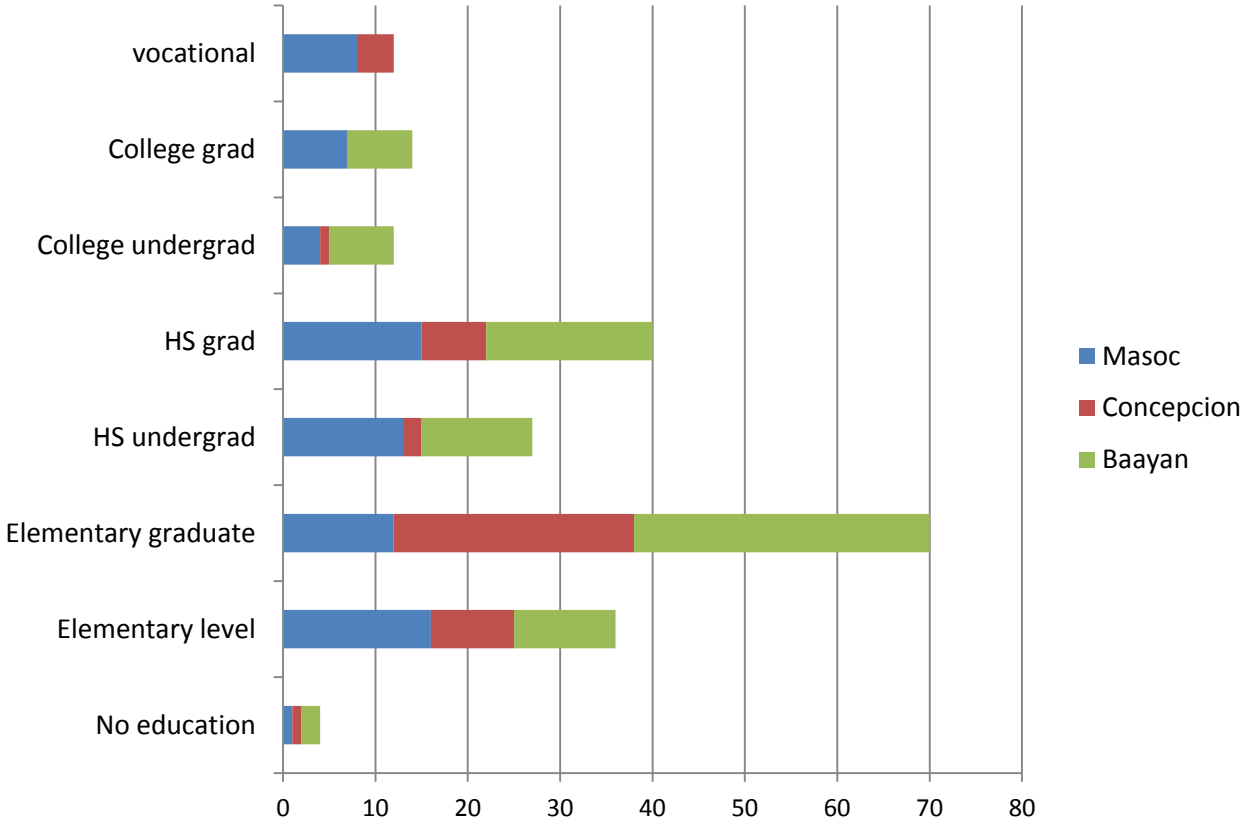
Socioeconomic Profile



		1-3	4-6	>6
Baayan		20	44	25
Concepcion		8	33	9
Masoc		32	33	11

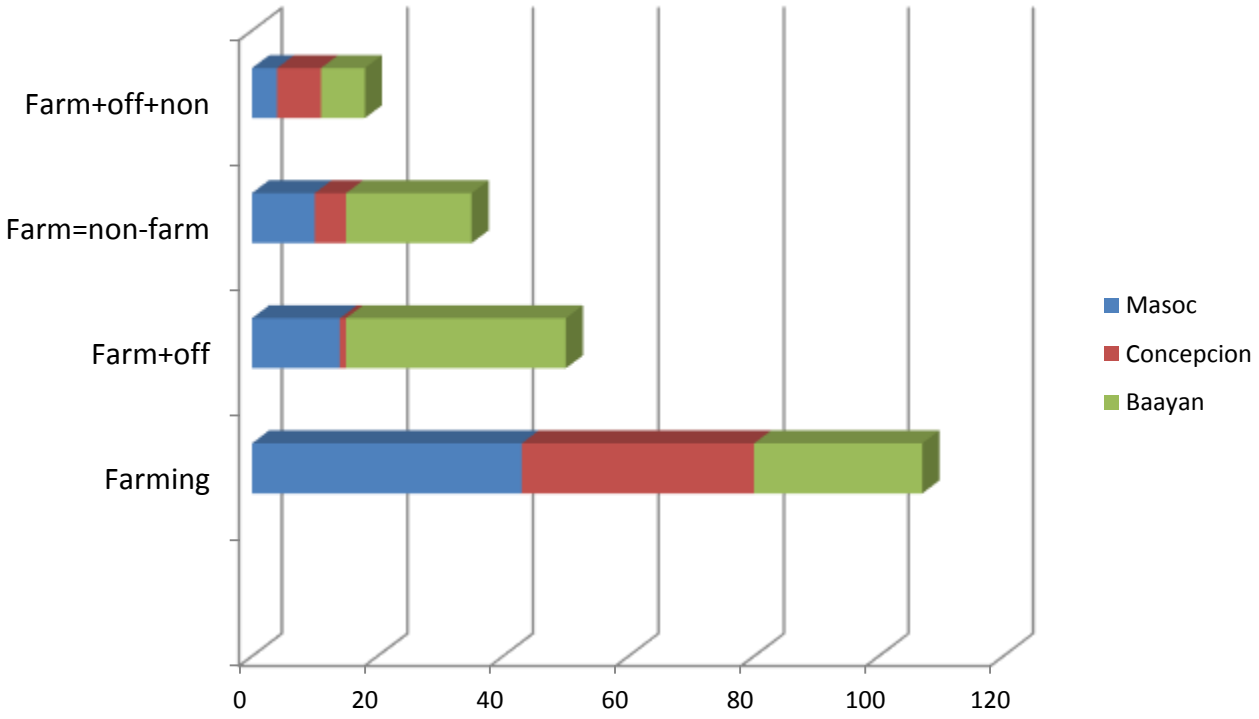
Household size of respondent-upland farmers in the three upland farming communities

Socioeconomic Profile



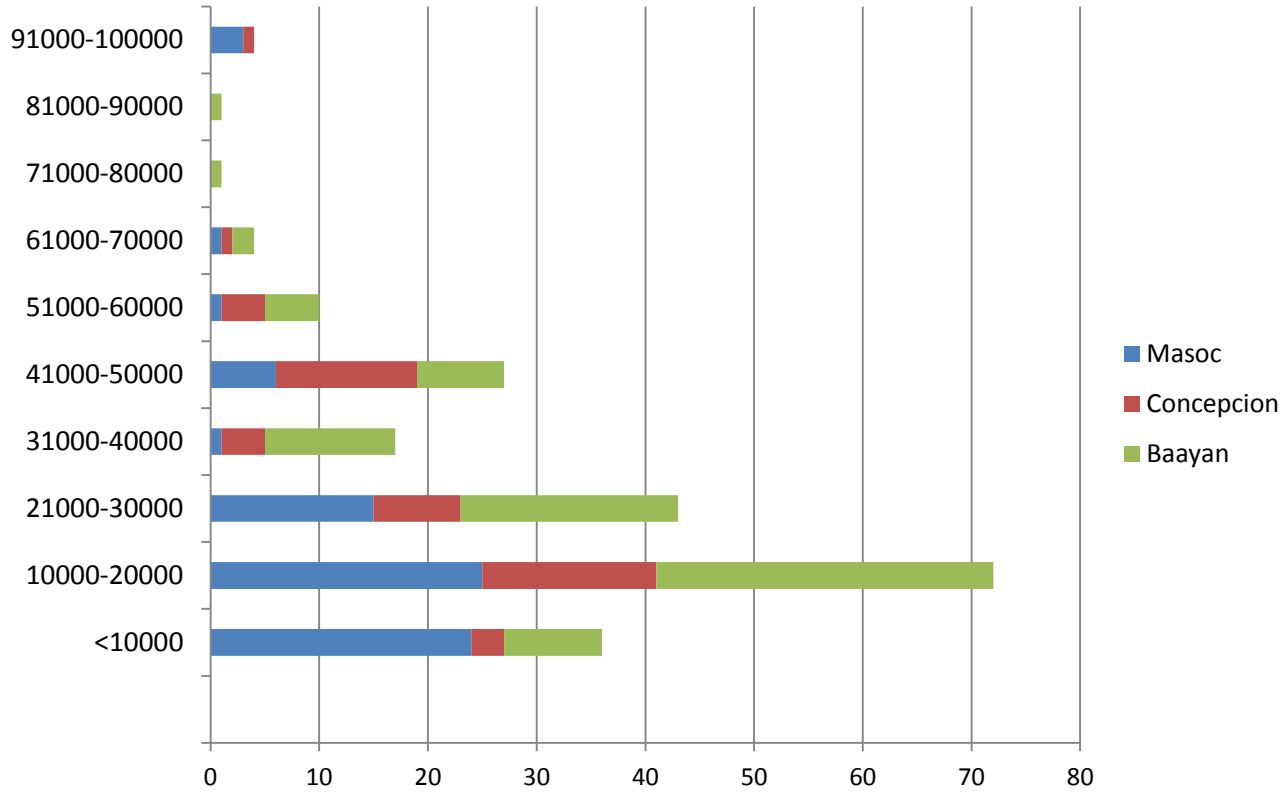
Educational attainment of upland farmers in the three upland farming communities

Socioeconomic Profile



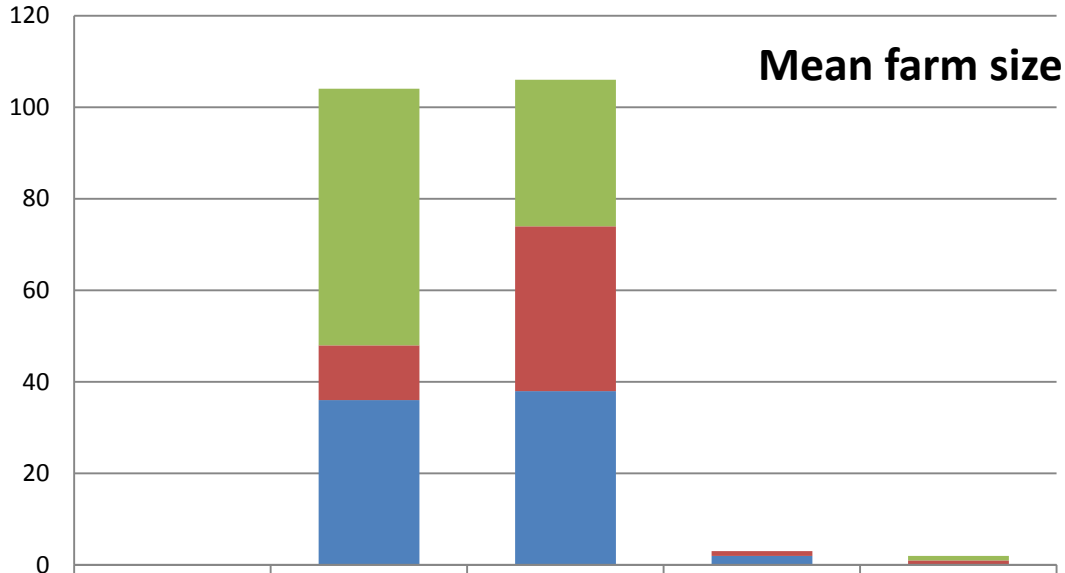
Income sources of upland farmers in the three upland farming communities

Socioeconomic Profile



Average annual household income

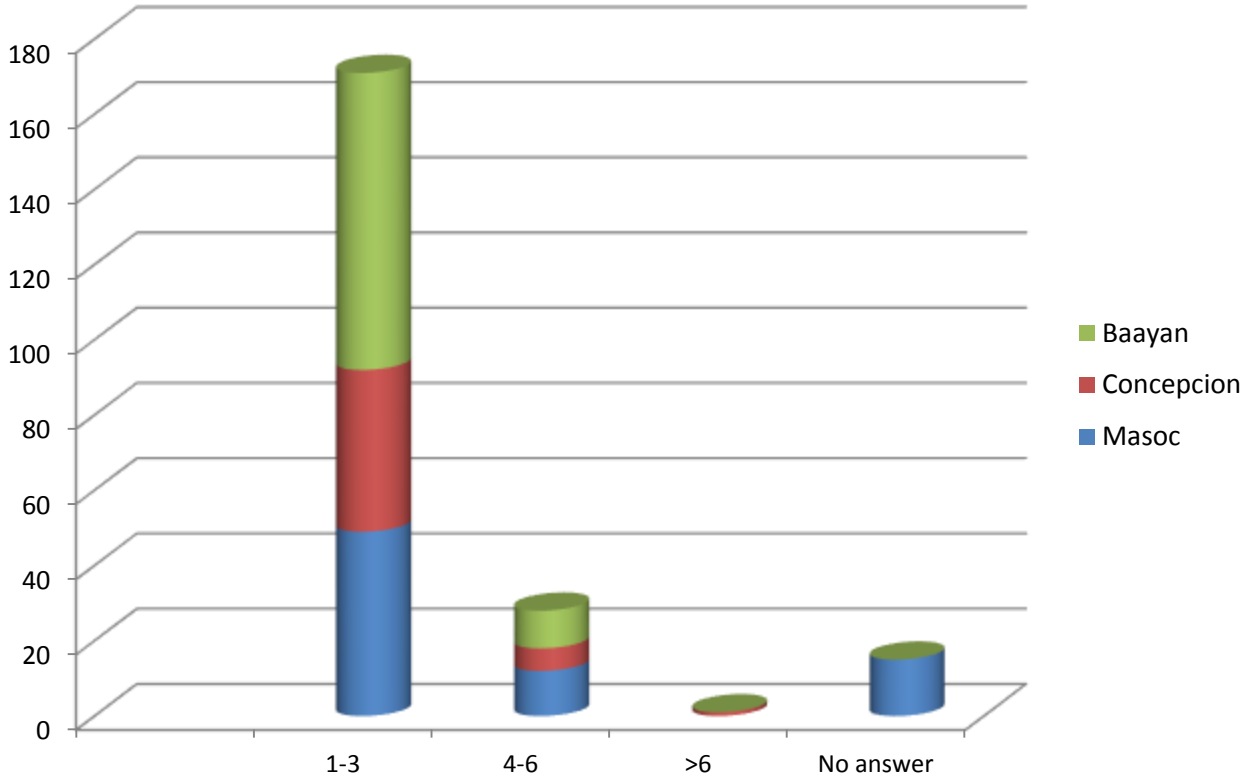
Socioeconomic Profile



	<1	1-3	3.1-6	>6
Baayan	56	32	0	1
Concepcion	12	36	1	1
Masoc	36	38	2	0

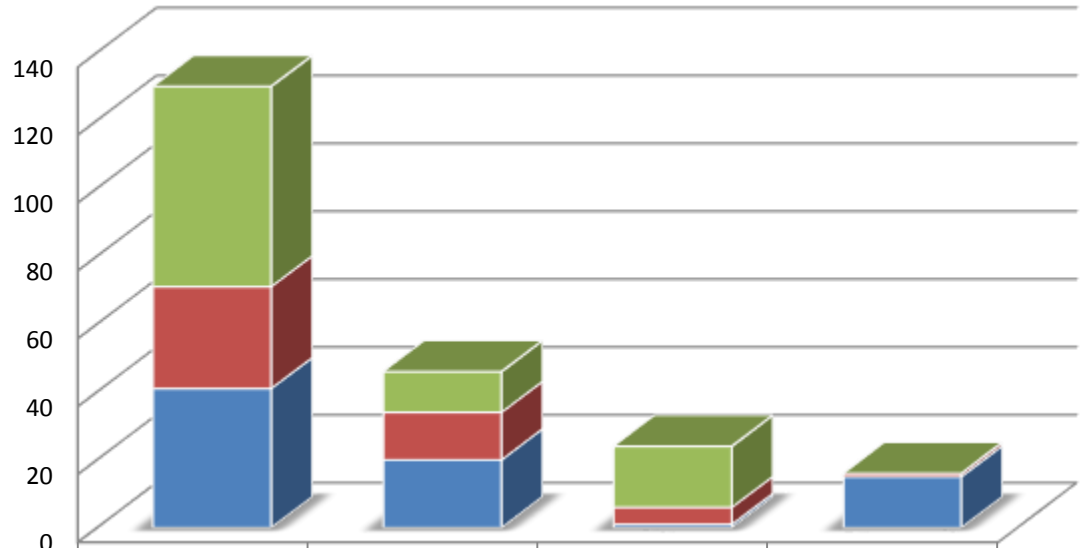
Farm sizes of upland farmers in the three upland farming communities

Socioeconomic Profile



Number of household members involved in farming

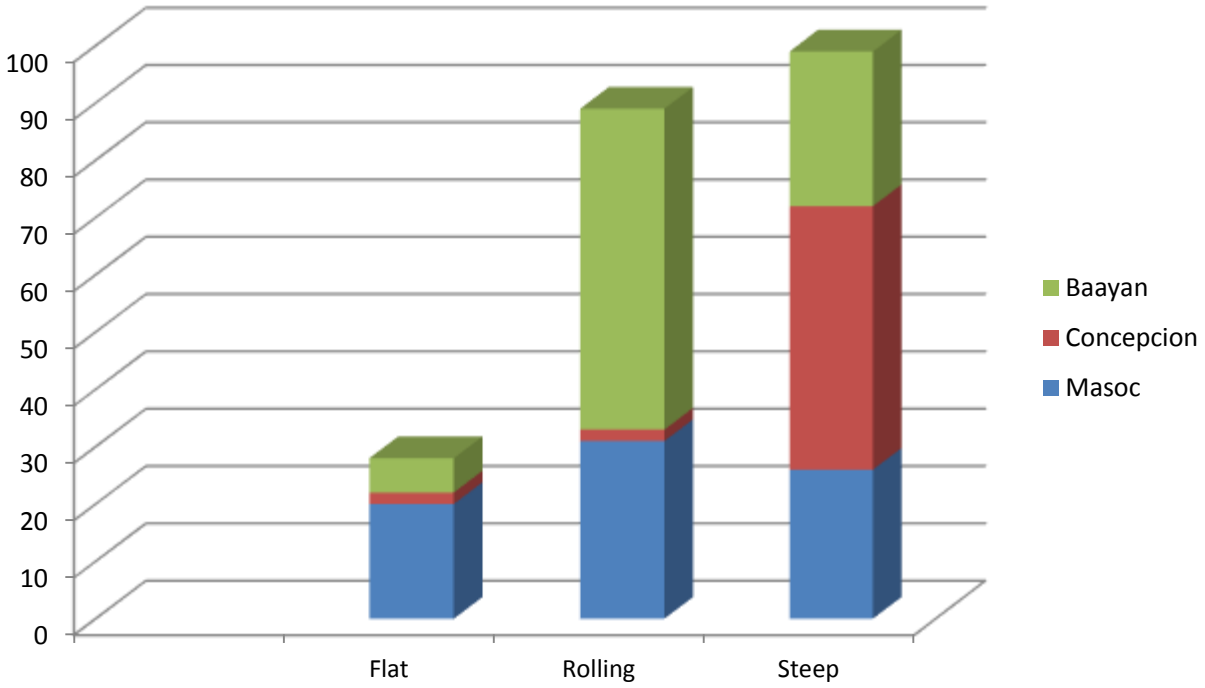
Socioeconomic Profile



	Owned	Tenant	Rented	Public land
Baayan	59	12	18	0
Concepcion	30	14	5	1
Masoc	41	20	1	15

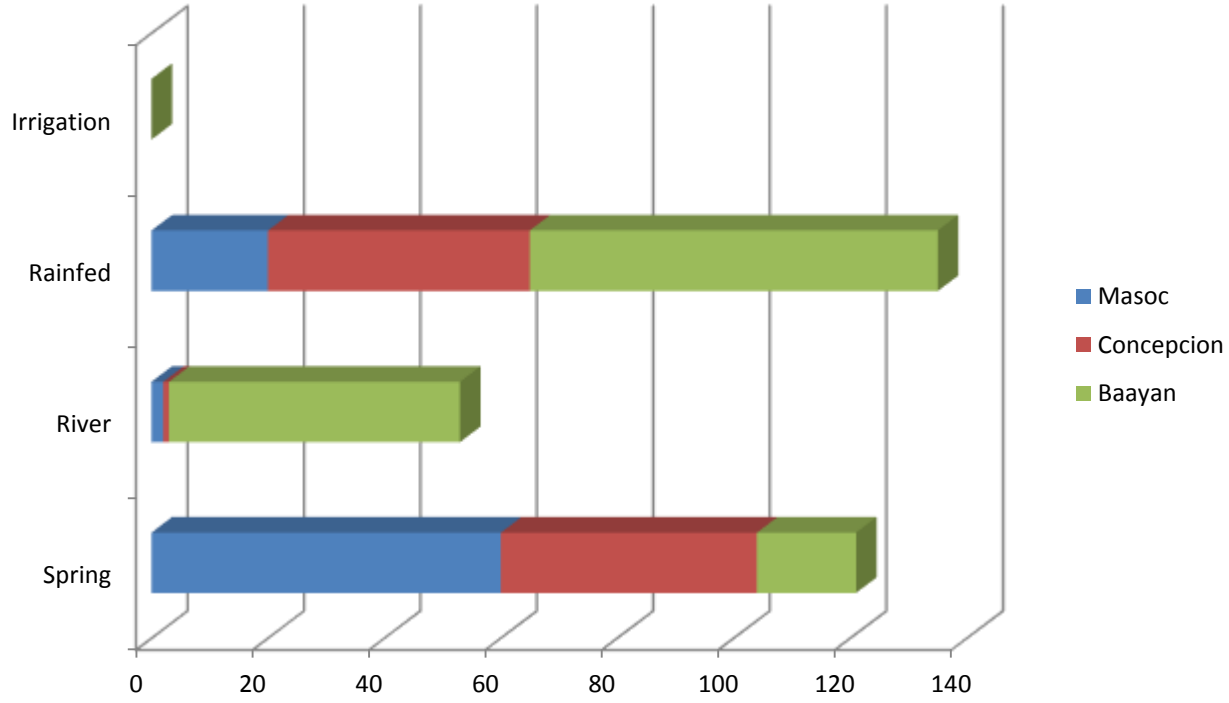
Status of farm ownership

Biophysical characteristics



Topography of farms cultivated by the upland farmers in the three upland farming communities

Biophysical characteristics

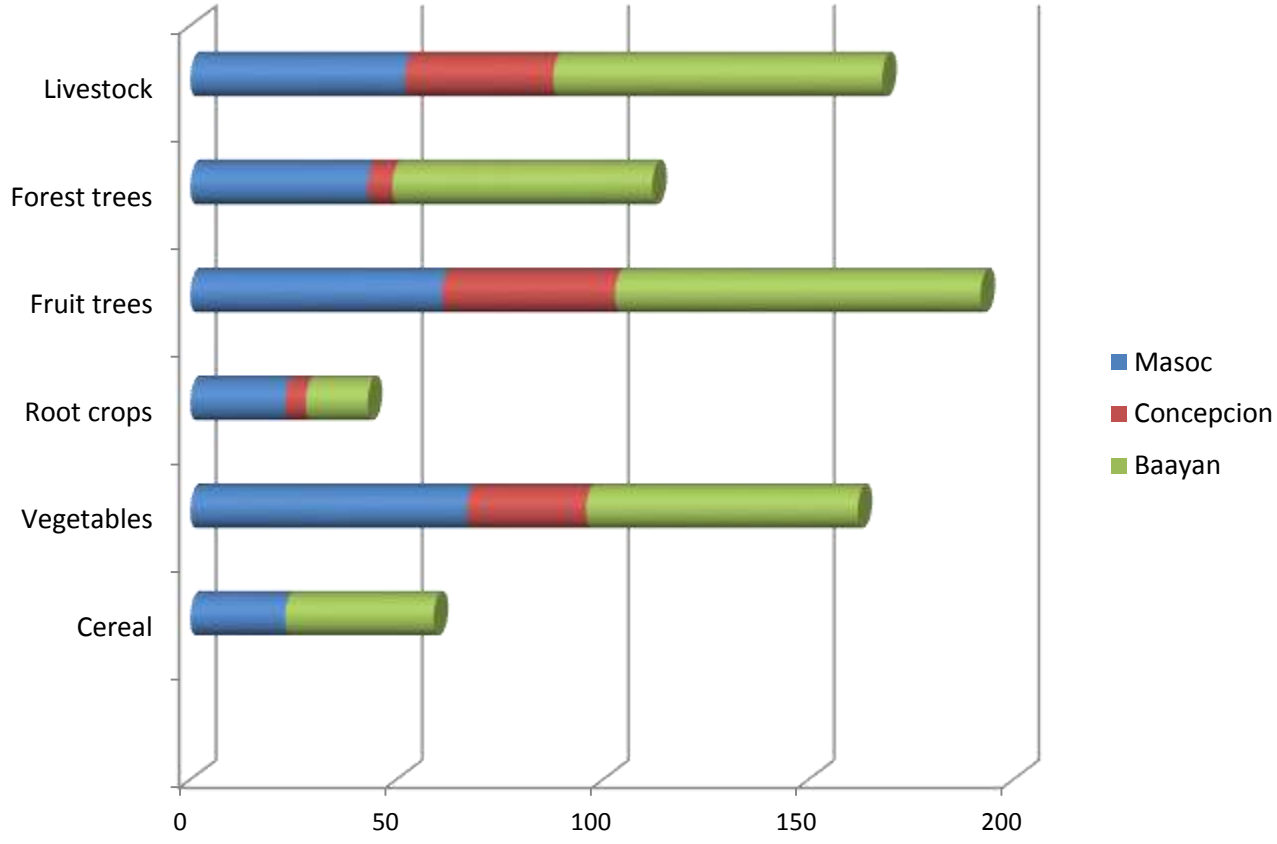


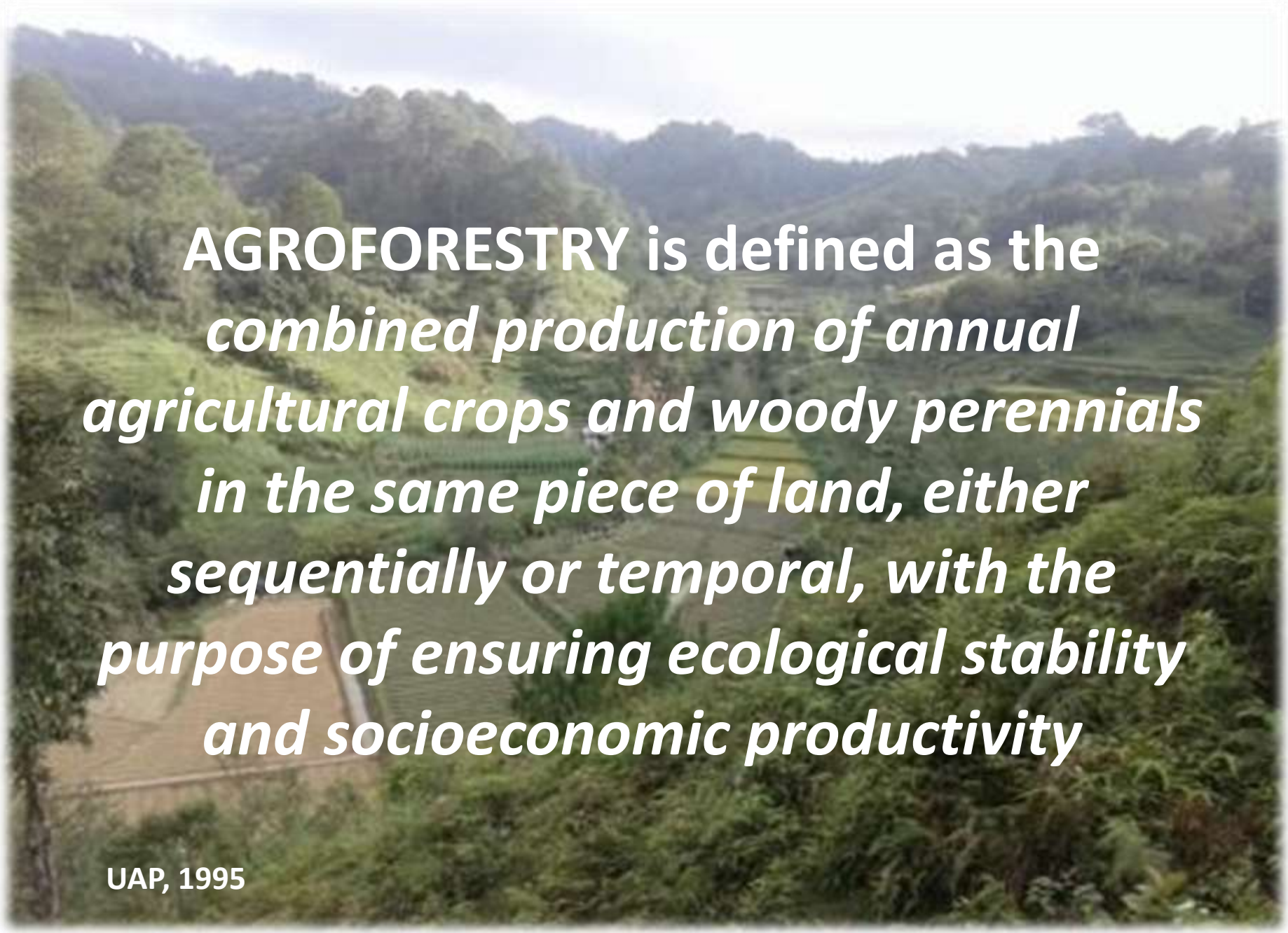
Source of water for irrigation

Agricultural Production Systems

PRODUCTION SYSTEMS	FREQUENCY			TOTAL	%
	Masoc, Bayombong, Nueva Vizcaya (n=76)	Concepcion Banahaw, Sariaya, Quezon (n=50)	Baayan, Tublay, Benguet (n=89)		
Monocropping	3	2	10	15	7
Relay cropping	8	4	3	15	7
Multiple cropping	4	13	30	47	22
Agroforestry	61	31	46	138	64
Total	**76**	**50**	**89**	**215**	**100**

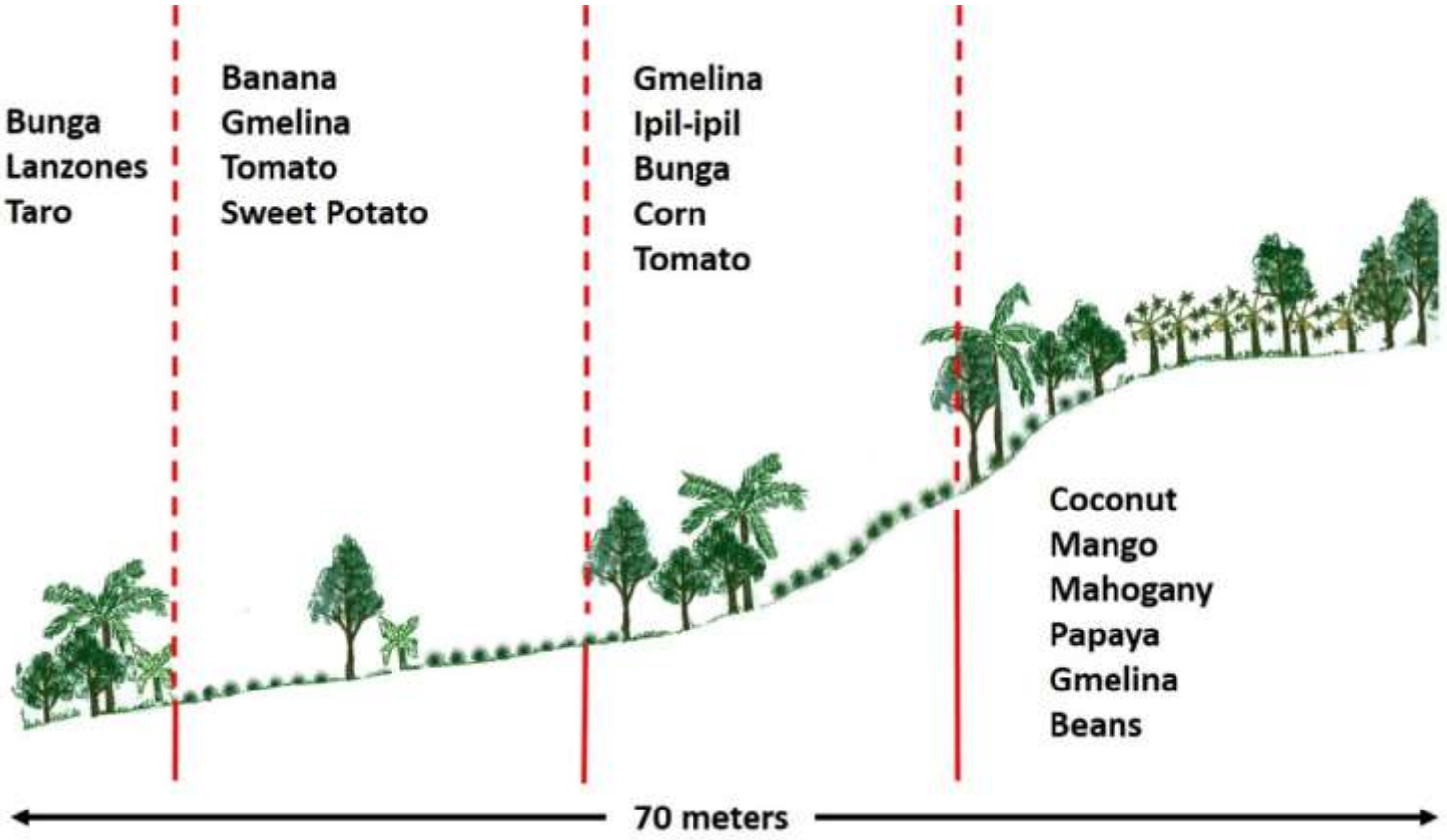
Agricultural Production Systems




AGROFORESTRY is defined as the
combined production of annual agricultural crops and woody perennials in the same piece of land, either sequentially or temporal, with the purpose of ensuring ecological stability and socioeconomic productivity
UAP, 1995

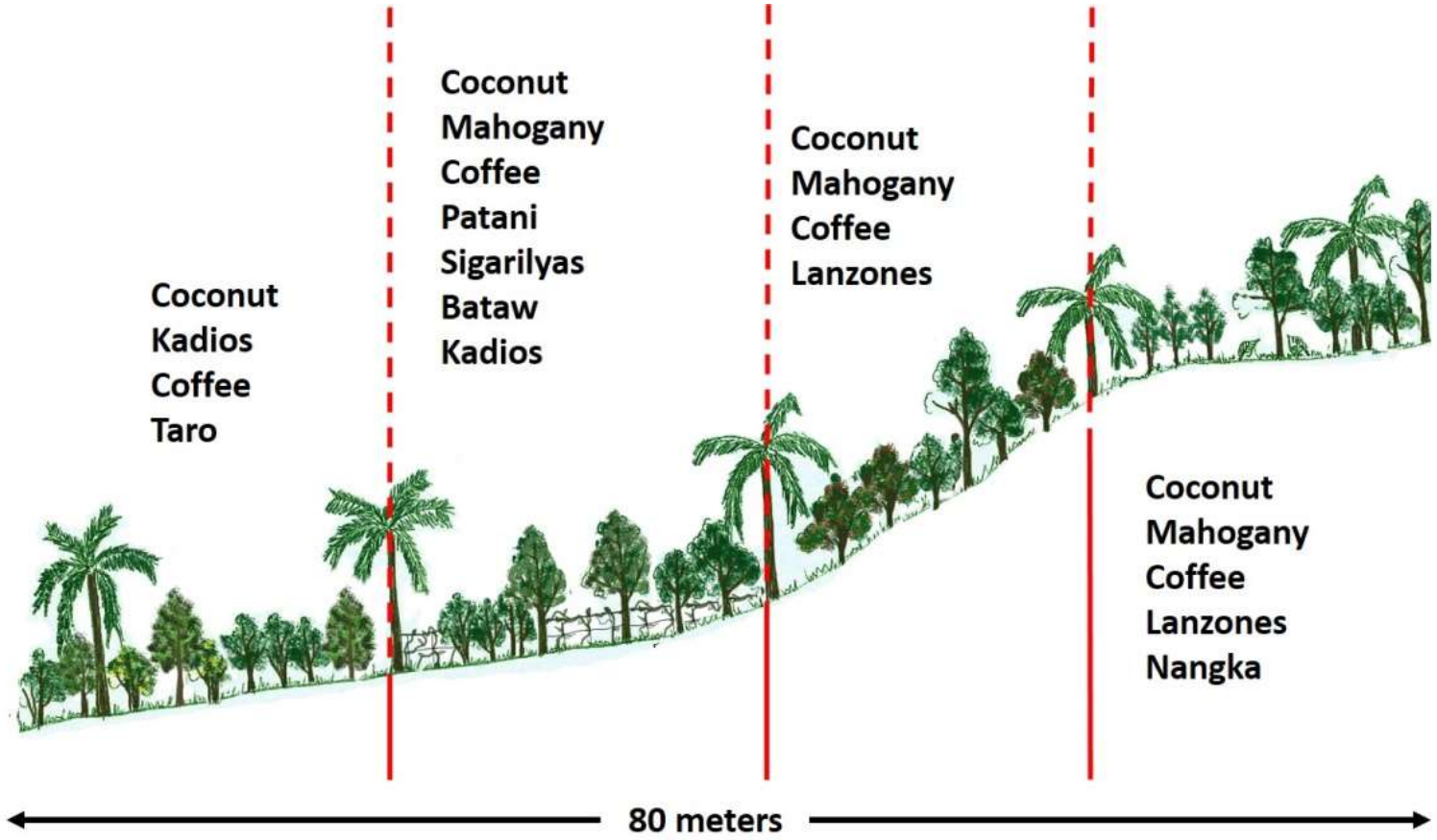
Agroforestry systems and practices in Barangay Masoc, Bayombong, Nueva Vizcaya

Crop components of agroforestry systems in Nueva Vizcaya: Transect map



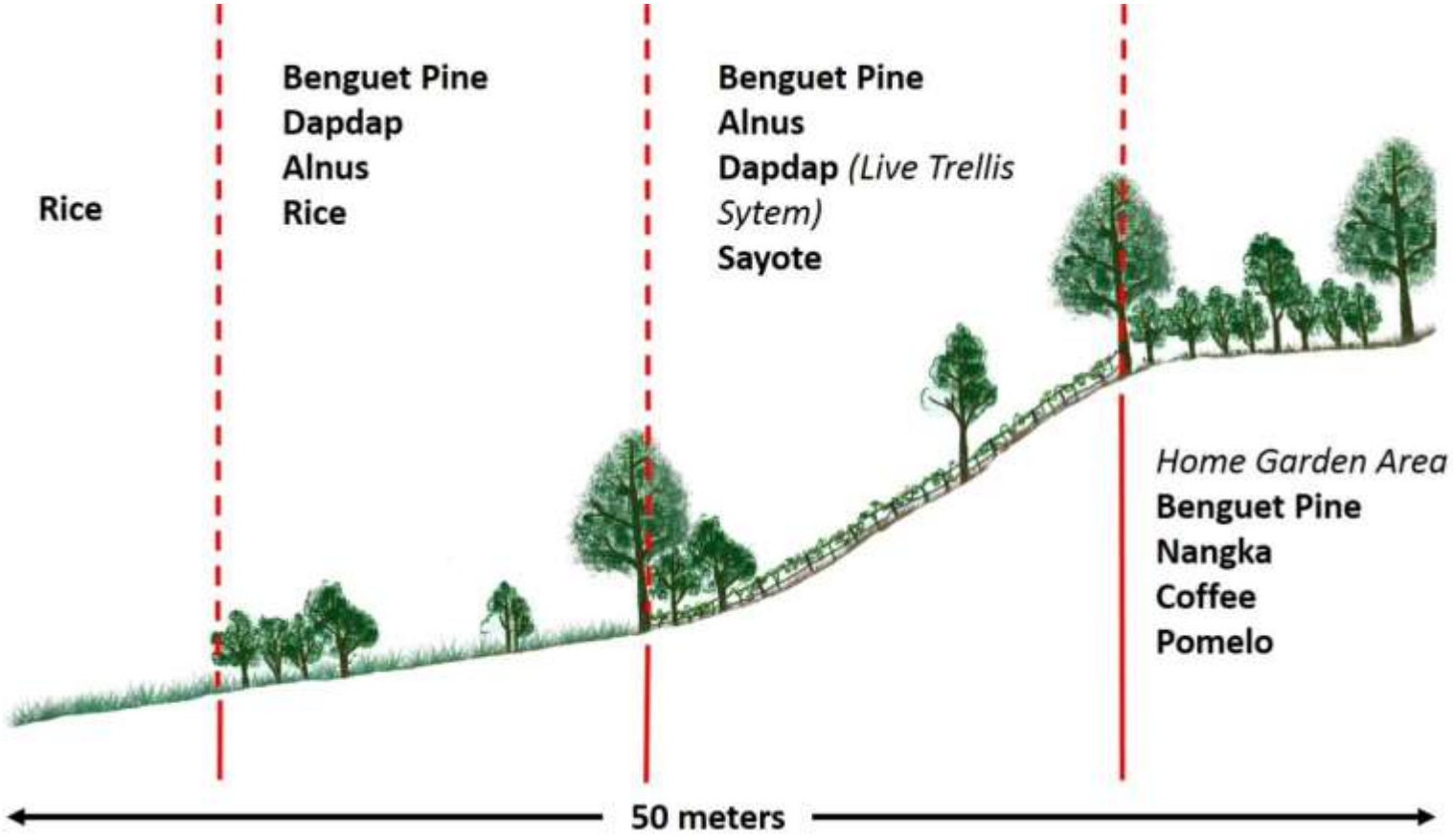
Agroforestry systems and practices in Barangay Concepcion, Sariaya Quezon

Crop components of agroforestry systems in Quezon: Transect map

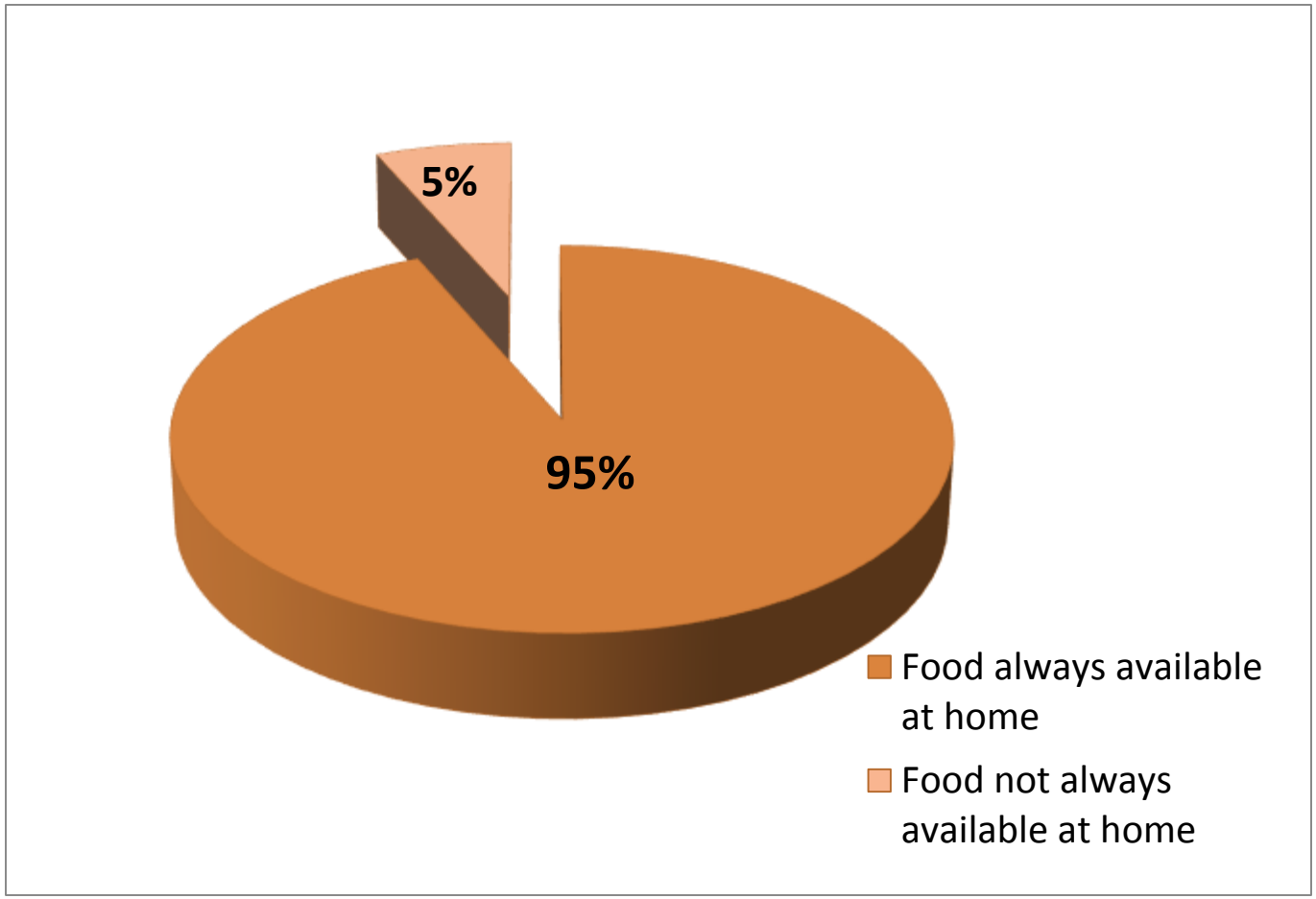


Agroforestry systems and practices in Barangay Baayan, Tublay, Benguet

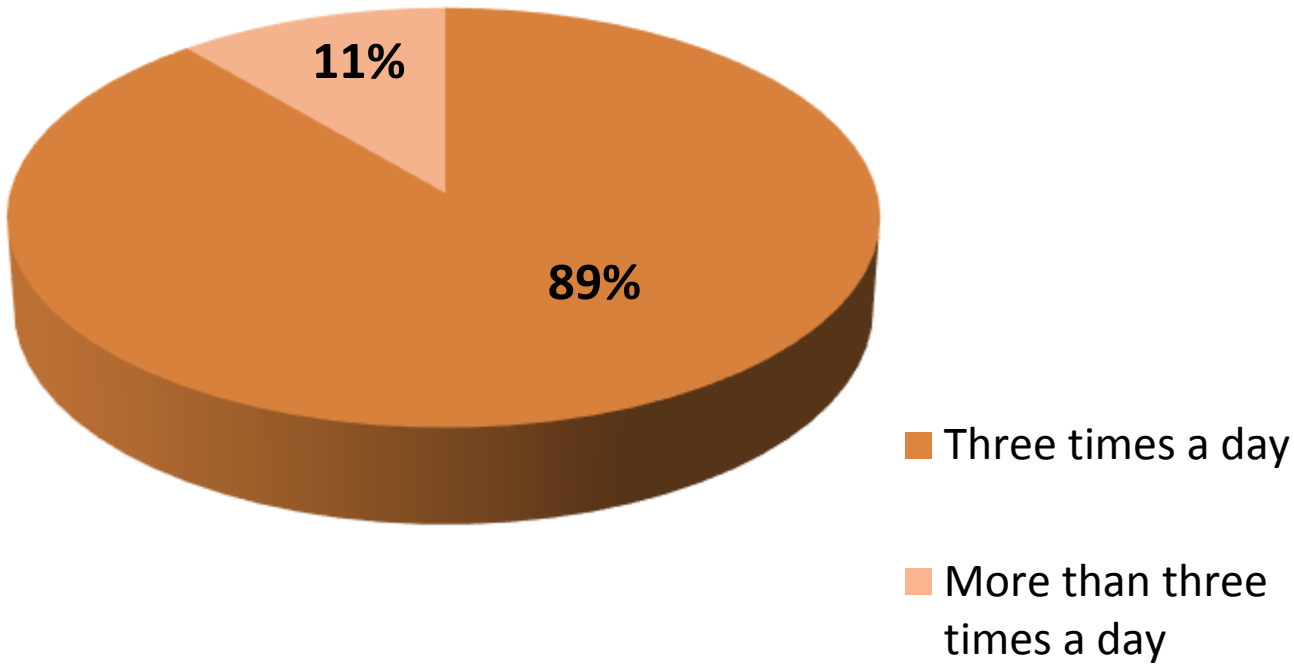
Crop components of agroforestry systems in Benguet



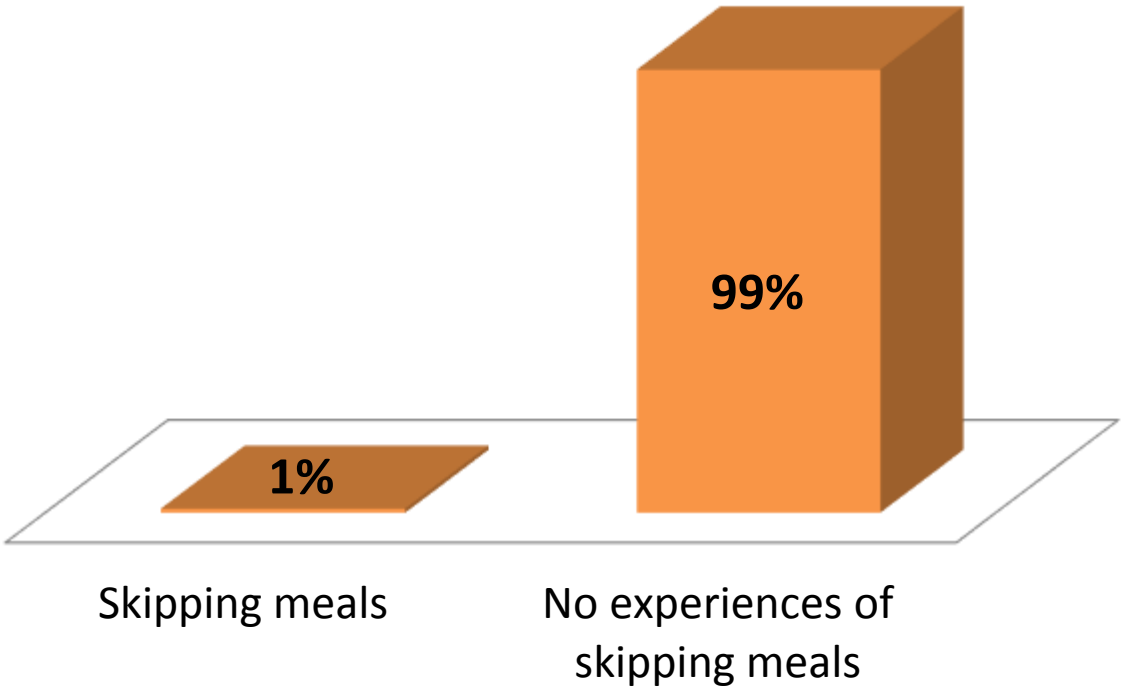
Food availability



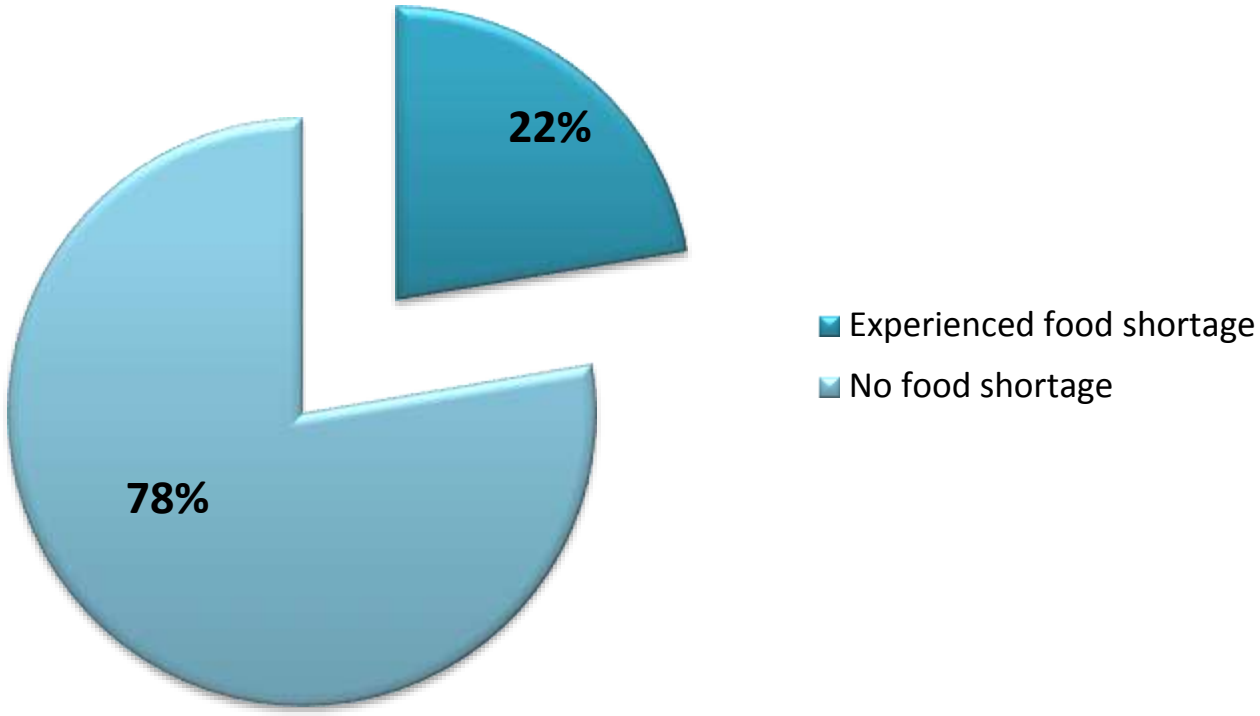
Eating frequency



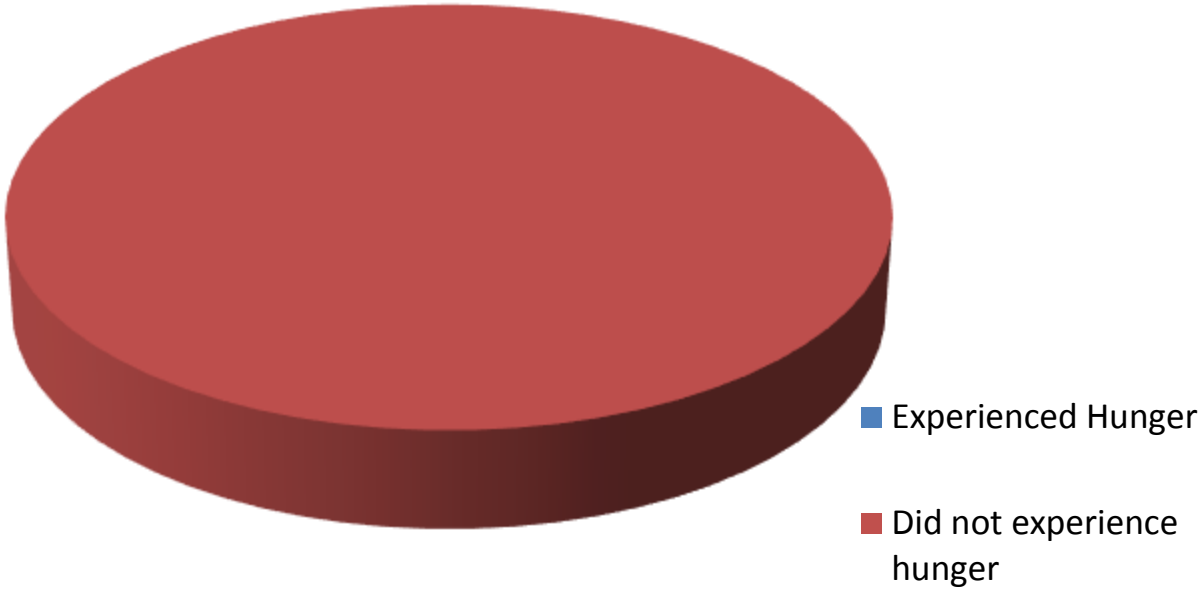
Experience of skipping meals



Experience of skipping meals



Experience of hunger



Food availability

FOOD SOURCES	FREQUENCY					
	Masoc	%	Concepcion Banahaw	%	Baayan	%
Own crop production	76	100	44	88	89	100
Own livestock production	13	17	18	36	38	43
Purchased from the market	42	55	41	82	88	99
Exchange of labor	0	0	0	0	16	18
Shared with relatives	0	0	0	0	17	19

Production Orientation

Crop components	Proportion of harvest for home consumption				Proportion of harvest intended for marketing			
	<50%	50%	>50% but <75%	>75%	<50%	50%	>50% but <75%	>75%
Barangay Baayan, Tublay, Benguet								
Rice	1	0	0	32	1	0	1	0
Vegetables	48	1	0	2	0	1	0	55
Root crops	1	2	0	7	0	2	0	4
Fruit trees	7	4	0	23	0	6	0	8
Barangay Massoc, Bayombong, Nueva Vizcaya								
Rice	0	1	0	2	1	0	0	0
Vegetables	44	1	0	0	0	1	0	44
Root crops	10	0	0	0	0	0	2	9
Fruit trees	4	0	0	0	4	0	0	0
Barangay Concepcion Banahaw, Sariaya, Quezon								
Vegetables	20	0	0	0	0	0	0	20
Root crops	15	0	0	0	0	0	0	15
Fruit trees	14	0	0	0	0	0	0	14

Food availability score

ITEM	WEIGHTED SCORES OF EACH OF THE STUDY SITES*					
	Masoc	Weighted Score	**Concepcion Banahaw**	Weighted Score	**Baayan**	Weighted Score
Food availability at home						
Always available	76	2.00	50	2.00	89	2.00
Eating frequency						
Three times a day	74	1.97	44	1.64	72	1.43
>3x a day	2	0.10	5	0.40	17	0.76
Experience of skipping meals						
Yes	0	0.00	2	0.04	0	0.00
No	76	2.00	48	1.92	89	2.00
Experience of food shortage						
Yes	13	0.17	18	0.36	8	0.09
No	63	1.65	32	1.28	71	1.60
Experience of hunger						
Yes	0	0.00	0	0.00	0	0.00
No	76	2.00	50	2.00	89	2.00
Food availability score	**9,89**		**9.64**		**7.88**	
Mean Score**	**1.97**		**1.93**		**1.56**	

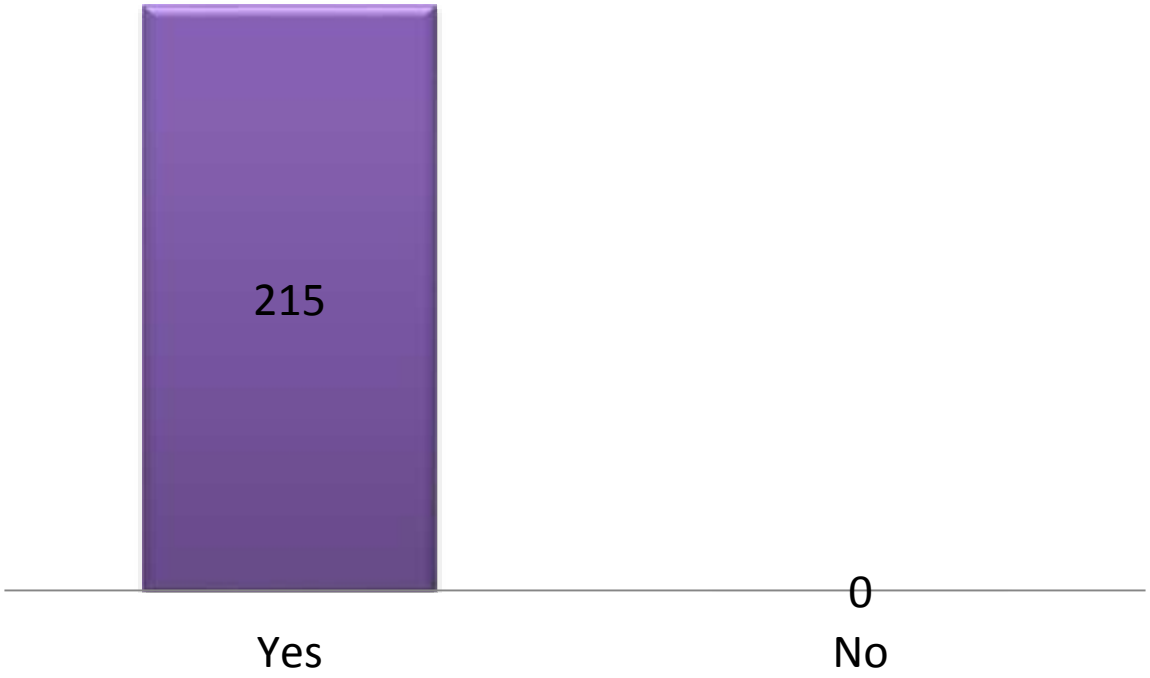
**weighted score was computed by multiplying the rate of each indicator with the frequencies divided by the total number of respondents. Numbers in parenthesis represent the rate given for each item*

**1.50 – 2.00 (food is highly available) 1.00 – 1.49 (food is moderately available), <1.00 (food is not available)

Food availability score

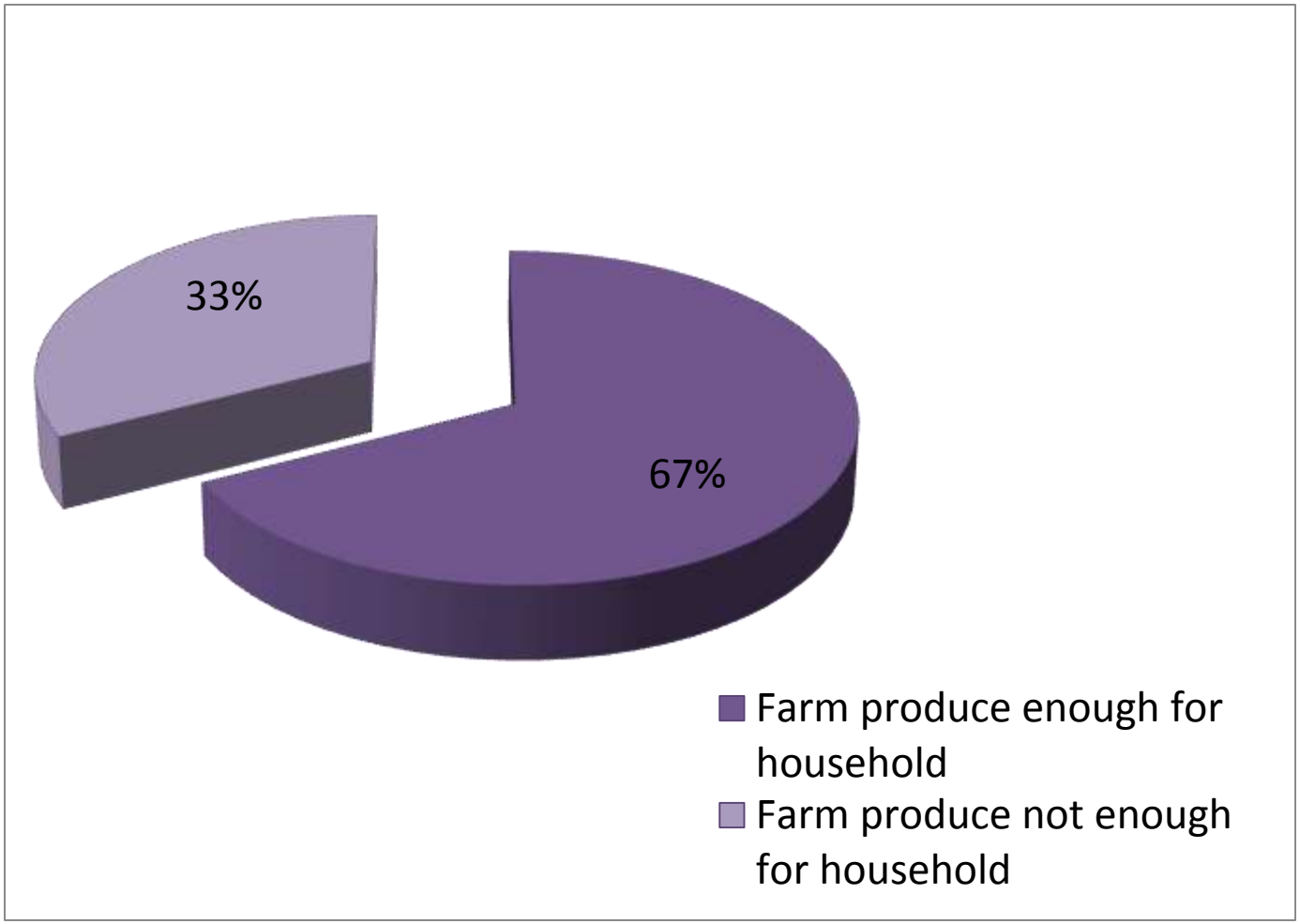
Farming System	Food availability		Skipping meals		Hunger		Shortage		Eating frequency		Balanced diet		Total Score	Mean Score
	Yes (2)	No (1)	Yes (1)	No (2)	Yes (1)	No (2)	Yes (1)	No (2)	3x a day	>3x a day	Yes (2)	No (1)		
MONO-CROPPING	2.00	0.00	0.00	2.00	0.00	2.00	0.36	1.23	0.93	0.13	1.80	0.10	10.55	**1.76**
RELAY CROPPING	2.00	0.00	0.00	2.00	0.00	2.00	0.57	0.86	1.00	0.00	2.00	0.00	10.43	**1.74**
MULTIPLE CROPPING	2.00	0.00	0.00	2.00	0.00	2.00	0.33	1.33	0.95	0.17	1.84	0.07	10.69	**1.77**
AGRO-FORESTRY	2.00	0.00	0.05	1.93	0.00	2.00	0.10	1.79	0.86	0.28	1.79	0.18	10.98	**1.83**

Food accessibility

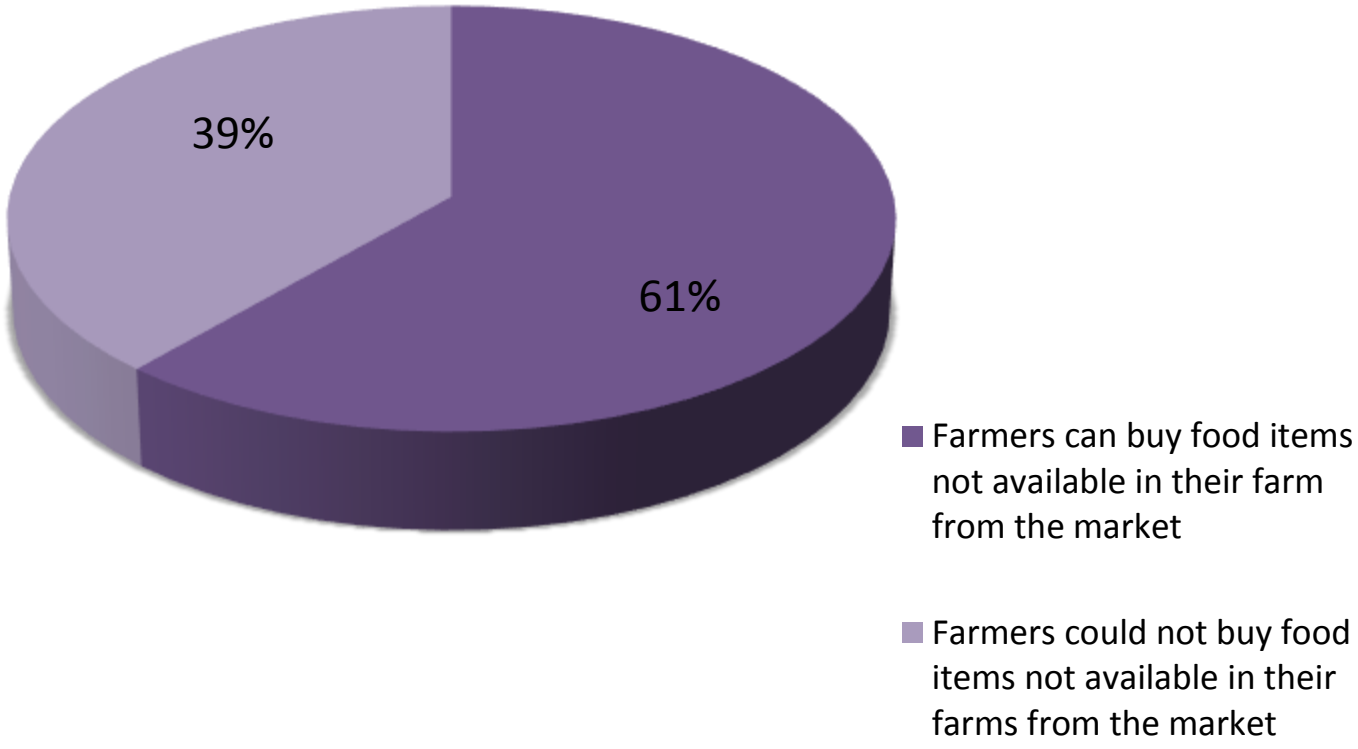


Food consumption at household level

Food accessibility



Food accessibility



Food accessibility score

ITEM	WEIGHTED SCORES OF EACH OF THE STUDY SITES*					
	Masoc	Weighted Score	Concepcion Banahaw	Weighted Score	Baayan	Weighted Score
Farm products are for home consumption						
Yes (2))	76	2.00	50	2.00	89	2.00
No (1)	0	0.00	0	0.00	0	0.00
Farm products are enough to meet the basic food needs						
Yes (2)	70	1.84	33	1.32	42	0.94
No (1)	6	0.08	17	0.34	47	0.53
Market is accessible as immediate food source if items are not available in the farm						
Yes (1)	71	1.87	43	1.72	18	0.40
No (1)	5	0.06	7	0.14	71	0.80
Food accessibility score	5.85		5.52		4.67	
Mean Score**	1.95		1.84		1.56	

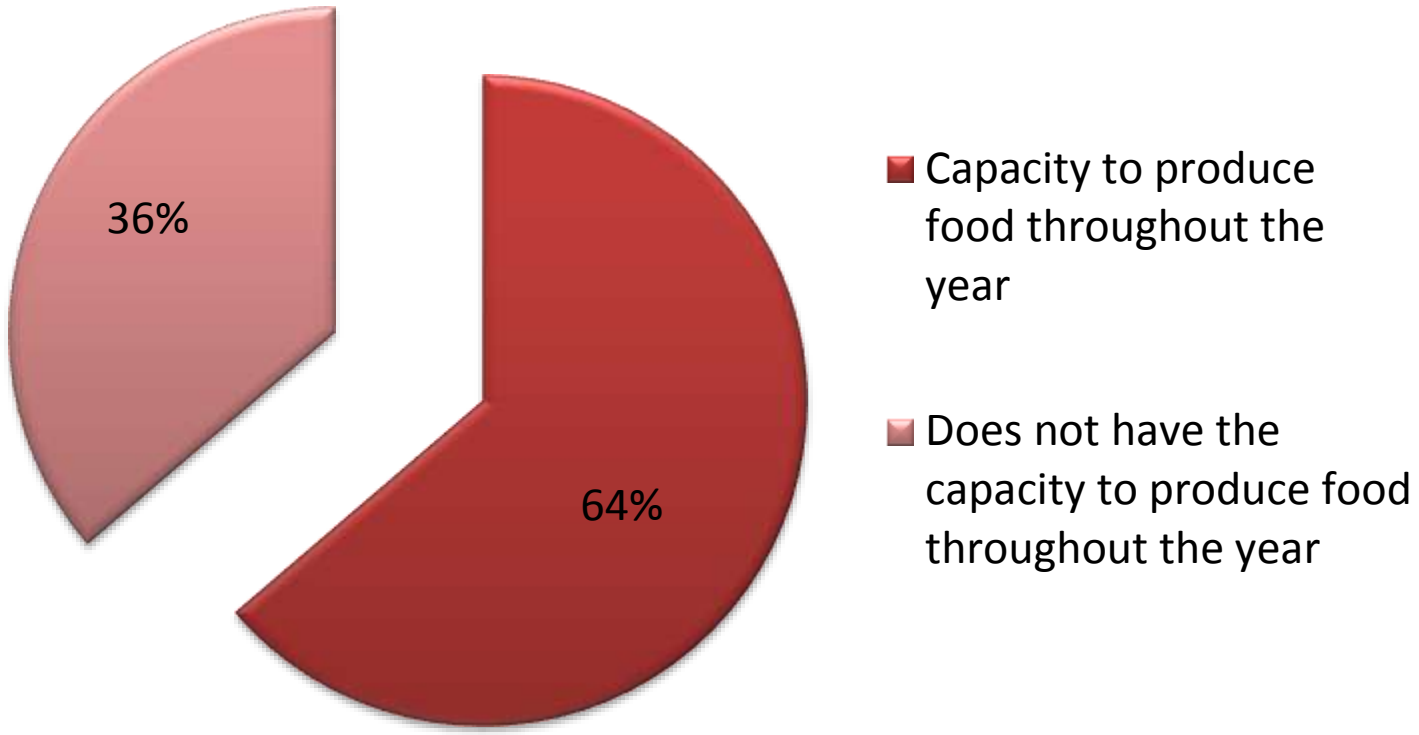
**weighted score was computed by multiplying the rate of each indicator with the frequencies divided by the total number of respondents. Numbers in parenthesis represent the rate given for each item*

*1.50 – 2.00 (food is highly accessible) 1.00 – 1.49 (food is moderately accessible), <1.00 (food is not accessible)

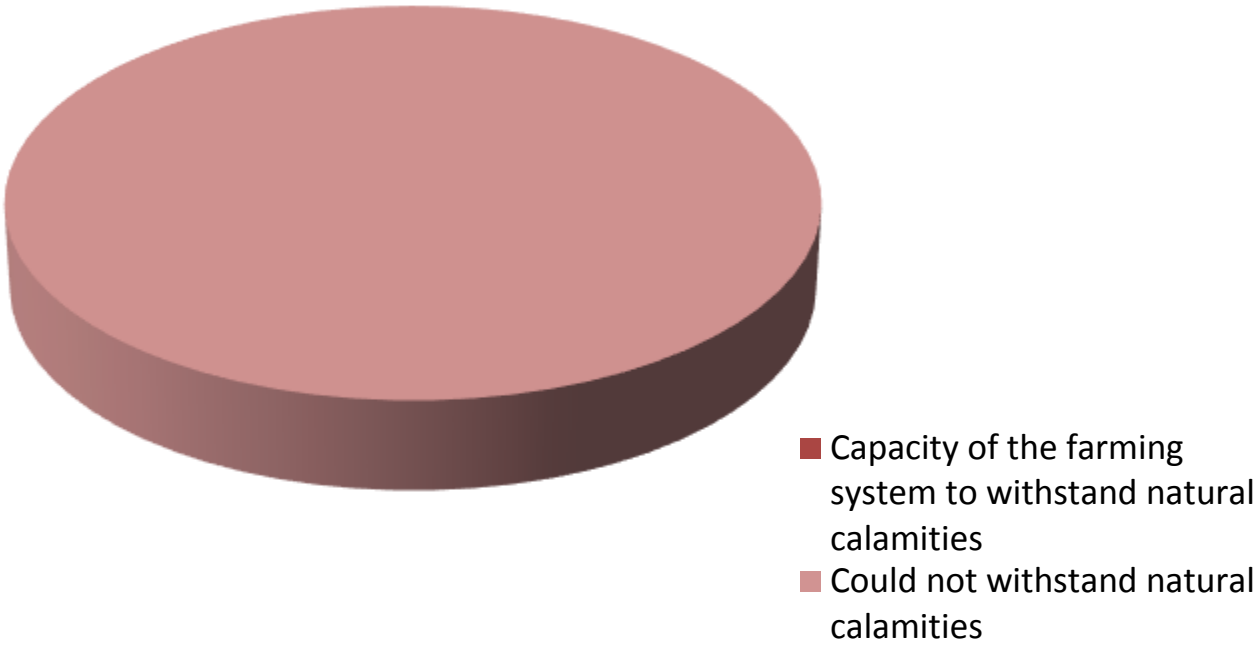
Food accessibility score

AGRICULTURAL PRODUCTION SYSTEM	WEIGHTED SCORE OF FOOD ACCESSIBILITY INDICATORS*						FOOD ACCESSIBILITY SCORE	MEAN SCORE
	Produce are consumed at home		Produce are enough to meet basic needs		Market is accessible for items not available on-farm			
	Yes (2)	No (1)	Yes (2)	No (1)	Yes (2)	No (1)		
Monocropping	2.00	0.00	0.81	0.76	1.71	0.14	5.42	**1.81**
Relay cropping	2.00	0.00	1.05	0.47	1.91	0.04	5.47	**1.82**
Multiple cropping	2.00	0.00	1.61	0.19	1.89	0.05	5.74	**1.91**
Agroforestry	2.00	0.00	1.92	0.16	1.33	0.36	5.77	**1.92**

Food stability



Food stability



Food stability score

ITEM	WEIGHTED SCORES OF EACH OF THE STUDY SITES*					
	Masoc	Weighted Score	Concepcion Banahaw	Weighted Score	Baayan	Weighted Score
Capacity of the farming system to produce food throughout the year						
Yes (2))	65	1.71	46	1.84	26	0.58
No (1)	11	0.15	4	0.08	63	0.71
Capacity of the farming system to withstand natural calamities						
Yes (2)	0	0.00	0	0.00	0	0.00
No (1)	76	1.00	50	1.00	89	1.00
Total Score	2.86		2.92		2.29	
Mean Score**	1.42		1.46		1.14	

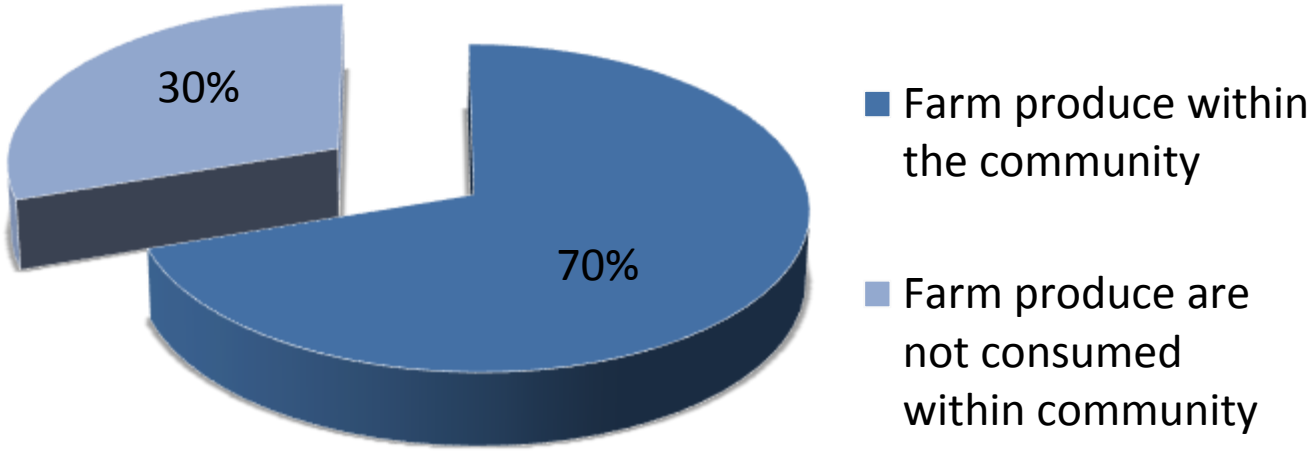
**weighted score was computed by multiplying the rate of each indicator with the frequencies divided by the total number of respondents. Numbers in parenthesis represent the rate given for each item*

**1.50 – 2.00 (food is highly stable) 1.00 – 1.49 (food is moderately stable), <1.00 (food is not stable)

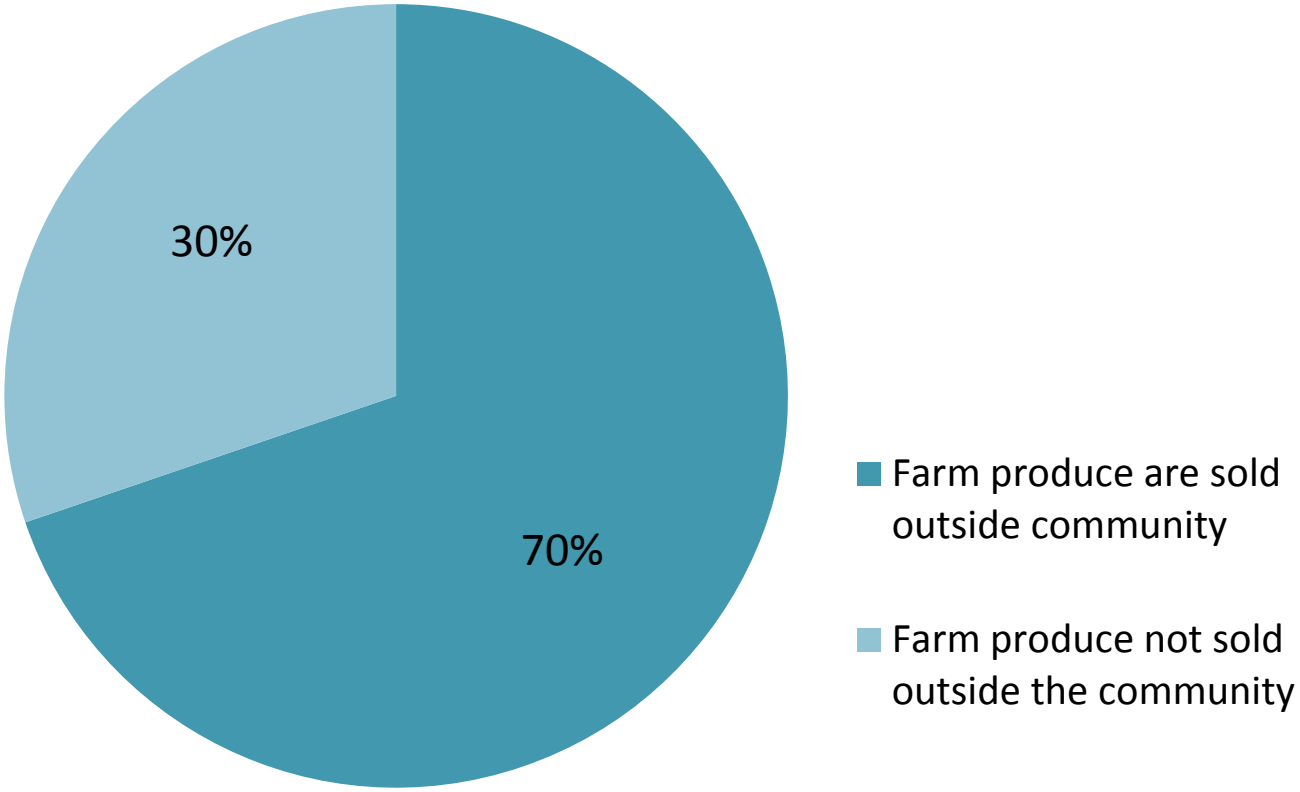
Food stability score

AGRICULTURAL PRODUCTION SYSTEM	WEIGHTED SCORE OF FOOD STABILITY INDICATORS*				FOOD STABILITY SCORE**	MEAN SCORE ***
	Capacity to produce food throughout the year		Capacity to withstand natural calamities			
	Yes (2)	No (1)	Yes (2)	No (1)		
Monocropping	0.74	0.63	0.00	1.00	2.37	**1.18**
Relay cropping	1.27	0.36	0.00	1.00	2.63	**1.31**
Multiple cropping	1.74	0.13	0.00	1.00	2.87	**1.34**
Agroforestry	1.75	0.18	0.00	1.00	2.93	**1.46**

Food utilization



Food utilization



Food utilization

ITEMS	WEIGHTED SCORES			
	Masoc	Concepcion Banahaw	Baayan	MEAN
Rice	1.01	1.00	1.02	**1.01**
Vegetables	1.12	1.41	1.12	1.22
Meat	1.05	2.02	1.42	1.50
Corn	1.28	2.16	1.6	1.68
Fruits	1.99	1.61	1.40	1.67
Bread	1.95	1.92	1.36	1.74
Fish	2.25	1.97	1.34	1.85
Canned goods	2.29	1.94	1.6	1.94
Noodles	2.75	1.90	1.92	2.19
Junk foods	2.88	2.09	1.66	2.21

Food utilization score

ITEM	WEIGHTED SCORES OF EACH OF THE STUDY SITES*					
	Masoc	Weighted Score	Concepcion Banahaw	Weighted Score	Baayan	Weighted Score
Farm produce are for marketing within the community/village						
Yes (2))	61	1.60	26	1.04	63	1.41
No (1)	15	0.20	24	0.48	26	0.29
Farm produce are sold outside the village/community						
Yes (2)	61	1.60	26	1.04	63	1.41
No (1)	15	0.20	24	0.48	26	0.29
Farm produce is consumed at home						
Yes (1)	76	2.00	50	2.00	89	2.00
No (1)	0	0.00	0	0.00	0	0.00
Food accessibility score	5.60		5.04		5.40	
Mean Score**	1.87		1.68		1.80	

**weighted score was computed by multiplying the rate of each indicator with the frequencies divided by the total number of respondents. Numbers in parenthesis represent the rate given for each item*

*1.50 – 2.00 (food is highly utilized) 1.00 – 1.49 (food is moderately utilized), <1.00 (food is not utilized)

Food utilization score

AGRICULTURAL PRODUCTION SYSTEM	WEIGHTED SCORE OF FOOD UTILIZATION INDICATORS						FOOD UTILIZATION SCORE	MEAN SCORE
	Produce are sold within the village		***Produce are sold outside the village***		***Produce are consumed at home***			
	Yes (2)	No (1)	Yes (2)	No (1)	Yes (2)	No (1)		
Monocropping	1.90	0.04	1.84	0.08	2.00	0.00	5.86	**1.95**
Relay cropping	1.54	0.23	1.32	0.34	2.00	0.00	5.43	**1.81**
Multiple cropping	1.69	0.15	1.68	0.28	2.00	0.00	5.80	**1.93**
Agroforestry	1.71	0.14	1.71	0.14	2.00	0.00	5.70	**1.90**

Food security score by community

INDICATORS OF FOOD SECURITY	BASE SCORE	MEAN SCORE*		
		Masoc, Nueva Vizcaya	Concepcion Banahaw, Quezon	Tublay, Benguet
Food availability	2	1.80	1.75	1.77
Food stability	2	1.42	1.46	1.14
Food accessibility	2	1.94	1.82	1.63
Food utilization	2	1.87	1.68	1.80
FOOD SECURITY SCORE*	8	**7.03**	**6.71**	**6.31**

**sum of the mean scores of the four indicators*

*7.00 – 8.00 (highlevel of food security) 6.00-6.99 (moderate level of food security), 5.00 – 5.99 (low level of food security) <5.00 (food insecure)

PRODUCTION SYSTEMS	FREQUENCY			TOTAL	%
	Masoc, Bayombong, Nueva Vizcaya (n=76)	Concepcion Banahaw, Sariaya, Quezon (n=50)	Baayan, Tublay, Benguet (n=89)		
Monocropping	3	2	10	15	7
Relay cropping	8	4	3	15	7
Multiple cropping	4	13	30	47	22
Agroforestry	61	31	46	138	64
%AF	80	60	51		
Total	**76**	**50**	**89**	**215**	**100**

Food security score by farming system

INDICATORS OF FOOD SECURITY	BASE SCORE	MEAN SCORE**			
		Mono cropping	Relay cropping	Multiple cropping	Agroforestry
Food availability	2	1.76	1.74	1.77	1.82
Food stability	2	1.18	1.13	1.31	1.46
Food accessibility	2	1.73	1.76	1.85	1.83
Food utilization	2	1.96	1.81	1.89	1.90
FOOD SECURITY SCORE*	8	**6.63**	**6.44**	**6.82**	**7.01**

**sum of the mean scores of the four indicators*

*7.00 – 8.00 (highl evel of food security) 6.00-6.99 (moderate level of food security), 5.00 – 5.99 (low level of food security) <5.00 (food insecure)

T-test of different production systems and food security scores

T-test						T-Critical Value					
Food Security (Total)											
P1 and P2	P1 and P3	P1 and P4	P2 and P3	P2 and P4	P3 and P4	P1 and P2	P1 and P3	P1 and P4	P2 and P3	P2 and P4	P3 and P4
-2.29209	-10.6729	-14.14601	-6.263772	-8.602325	-15.9434	2.14478	2.07961	2.11990	2.10092	2.13145	2.09302

Production systems 1,2 3 and 4 corresponds to monocropping, relay cropping, multistorey and agroforestry, respectively.
T-test of pooled means for food security parameters indicates similar pairwise mean comparison.

Potentials of agroforestry for ensuring food security

- **Crop diversity (with different crop duration) ensures multiple produce throughout the year**
- **Interactions of the crop components promote nutrient cycling**
- **Ecological services (e.g. erosion control potentials of crop components, supportive technologies) help improve soil condition and crop production**

SUMMARY AND CONCLUSION

- **The upland farmers in the three study sites are indeed smallholder farmers having small landholdings and farm income, and having low levels of formal education**
- **The farms that they cultivate are considered as marginal areas having steep slopes that are prone to soil erosion; and having limited sources of water for irrigation, as most of these farms are rainfed**
- **Geographically, these upland communities are situated in far flung areas which may have become a constraint in accessing basic social and technical services from the concerned agencies.**

SUMMARY AND CONCLUSION

- **Agroforestry systems provide potentials in ensuring food security; but are vulnerable to strong typhoons and drought**
- **Barangay Masoc in Nueva Vizcaya had the highest level of food security**
  - ***Highest number of agroforestry practitioners***
  - ***More diverse crop production – cereal crops, vegetables, root crops, fruit trees and forest trees***

RECOMMENDATIONS

- **Promote the use of agroforestry as a production technology of the government and/or non-government programs on sustainable forest management and upland development**
- **Programs or policies should put emphasis on the use of fruit tree-based agroforestry system to avoid further opening or clearing of forested areas in higher and mid-elevation areas; and enhance the use of soil and water conservation measures and other supportive technologies to control soil erosion and degradation particularly in high-elevation areas**

RECOMMENDATIONS

- **Promote technologies and other sources of livelihood (non-farm activities) that would address food production in times of natural calamities**
- **Conduct an in-depth research about the Local Food Systems that exist along the landscape of upland farming communities**
  - ***To trace the path of agroforestry products from the farm to the consumers***
  - ***To assess the level of food security of the household-consumers of agroforestry products***


THANK YOU!!!!