



## RESEARCH PAPER

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## Upland rice cultivation practices in Cagayan Province, Philippines

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### Abstract

The study was conducted to ascertain the cultivation practices of upland rice farmers in Cagayan province, Philippines. The study was conducted for a period of one year from July 2016 to June 2017 covering the wet planting season and dry planting season. The study sites were 13 municipalities and 28 barangays identified as upland farming areas based on records provided by the Department of Agriculture regional and provincial offices. Purposive sampling was employed while a structured questionnaire was utilized to aid data gathering through personal interviews. Data were analysed using descriptive statistics. Results revealed that upland rice farmers in Cagayan are in their middle age, mostly male with relatively low level of education, with limited training exposure related to agriculture specifically on rice production by government line agencies, conducted in their respective barangays and municipalities. The upland rice farmer respondents are cultivating a total land area of 322.7 hectares. In their cultural management practices, only few employ manual and mechanical plowing, harrowing, levelling and mechanical rotavating. Most of the respondents practice traditional harvesting method with produce intended for home consumption. Whereas they assessed upland rice farming as an environmentally suitable and safe and healthy farming practice compared to lowland farming. They also enumerated lots of their experienced problems with their corresponding recommended solutions.

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## Introduction

Rice remains as staple food for Filipinos, reason for the majority (60-65%) of the Filipino farmers prefer rice production over other crop commodities which made our country ranks 8<sup>th</sup> as rice producer in the world. Consequently, rice farming is the highest labor absorption (11.5million farmers) among the different sectors of Philippine agriculture, though farmers engage in this kind of industry belong to the lowest income bracket (PhilRice 2007).

In support to this prime commodity of the country, the Department of Agriculture continuously generate rice production breakthroughs like the 5 production cycle in two years in irrigated rice lands and the creation of Organic Agriculture Act of 2010 (Republic Act No. 10068) to ensure food safety and security. Along these efforts of the Department of Agriculture, upland rice farming is considered an important initiative in attaining the goal of rice sufficiency and food safety because upland lands are potential expansion in rice production while all the lowland areas for rice production are being utilized.

Meanwhile, Region 02 ranks second to Central Luzon as the rice granary of the country, being the object of DA RFO2 as their major commodity concern. DA region 02 also assist upland rice production in the different upland rice growing municipalities in the region. While upland rice area in Cagayan Valley constitute about 5.7% or 2 1,870 hectares of the 383,910 hectares total rice land area in Region 02.

With the advancement and modernization of technology, rice production programs on high yielding varieties and early maturing varieties were pushed in the past three decades backed up by the development and expansion of the irrigation facilities and the development of package of technologies involving excessive use of inorganic fertilizer, chemical based insecticides and weedicides.

With the realization of the consuming public on the harmful effects of chemical fertilizers, weedicides and pesticides both to human health and the environment, organically grown traditional rice is

gradually making a come-back. Though farmers had many rice varieties grown in the past, the Department of Agriculture (DA) is carrying out development and improvement of upland rice varieties that can generate higher yields which capitalizes on native varieties' drought tolerance in support to organic agriculture and adaptive to the effect of climate change. Also, upland rice varieties have better taste and can be kept for a longer time without spoiling compared to varieties grown in the lowlands.

Upland rice cultivation in Cagayan province is distributed in 18 municipalities with a total area of 3,502.49 hectares. The recent increase in upland rice cultivation was influenced by the organic agriculture campaign for food safety and sufficiency (DA Region 02). As a part of the initiative the Department of Agriculture encouraged upland rice farmer co-operators in the different municipalities where there are recorded farmers who support and cooperate. It was noted that most varieties grown in upland rice areas are traditional varieties which are less input intensive and usually requires natural growing practice. Hence, the intention of this research to determine the cultivation practices of upland rice farmers in Cagayan province. This study ascertains the upland rice cultivation practices of rice farmers in Cagayan Province, Philippines. It specifically aims to: (1) determine the socio-demographic profile of the farmers; (2) identify the farm and farming characteristics of upland rice cultivation; (3) Identified cultural practices in upland rice cultivation; (4) Identified the benefits, effectiveness of farming information, problems and recommended solutions.

## Materials and methods

### *Research Design*

This research study made use of descriptive-correlational design. The descriptive design involves the description of all the variables utilized in the study. While correlational design determined the degree of relationship of variables.

### *Research Areas*

The study considered the upland rice producing 13 municipalities and 28 barangays in the province of Cagayan.

### Population and Sample Size

The purposive sampling technique was employed where all the listed upland rice farmers available in the barangays during the data gathering were interviewed. Schedule of interviews were pre coordinated to the Municipal Agricultural Officer, the Agricultural Technician assigned and to the barangay captains.

### Research Study Areas

The study was conducted in the thirteen municipalities of the Province of Cagayan, Philippines namely: Alcala, Baggao, Buguey, Gataran, Gonzaga, Lallo, Lasam, Pamplona, Rizal, Santa Ana, Santa Teresita, and Tuao.



**Fig. 1.** Map of the Province of Cagayan showing the 13 municipalities as sites of the study.

### Respondents

The respondents of the study were the 269 upland farmer respondents purposively selected from the 13 municipalities of Province of Cagayan, Philippines.

### Instrument and Data Gathering

A structured questionnaire was designed to aid the gathering of data through personal interview. Personal interview was done in the 28 barangays covered in the study.

This study covered the rice wet planting season May-September 2015 and dry planting season November – March 2016.

### Data Collection and Analysis

Enumerators and data encoders were hired to handle the survey and data collection. Enumerators were briefed and oriented on the different items asked from the respondents. Data were collected through personal interview to ensure the validity and accuracy of data gathered and to minimize validation of data. Data gathering was complemented with actual observations and documentation. Researchers convened the enumerators every end of the day to evaluate the completeness and veracity of data gathered and to address problems and issues encountered in the course of data gathering. Researchers, together with the statistician, designed an encoding template in the Excel and data analysis using SPSS was done after encoding using descriptive statistics like frequency counts, percentages, means and standard deviation. Categorization of upland rice farming practices i.e.

## Results and discussion

### Socio-demographic profile

Findings reveal that upland rice farmer respondents are in their middle age with a mean age of 44.14 years old, with family size of 5 and who are in the farming industry for more than 13 years. Majority (69.5%) of them are males and the rest are females. Considering the study locale covering the top 13 upland rice producing municipalities in the province of Cagayan, all the respondents can speak Iloko as the major dialect spoken in the province. Almost all (98.88%) of them attended formal schooling, most of them attained elementary level and elementary graduates. While there are 3 of them who never attend formal schooling, these are the indigenous people living in the highlands and going to school was a big issue because of the far distance and difficulty of the pathway. Barely one-fourth of the respondents are affiliated with organizations and only 19.7 percent attended seminar related to farming while 14.5% said that they are farmer co-operators on upland rice farming assisted by the Department of Agriculture.

**Table 1.** Socio-demographic profile of respondents.

Social Profile	Mean	Standard Deviation
Age	44.14	12.61
Family size	5	3
Years in farming	13.16	12.11
	Frequency	Percent
Sex		
Female	82	30.5
Male	187	69.5
Dialect Spoken (Iloko)	269	100
Education(With Education)	266	98.88
With Membership in Organization	80	29.3
With seminar/training Sponsored by Department of Agriculture	53	19.7
Farmer Cooperator (Department of Agriculture)	39	14.5

\*Multiple responses

Table 2 denotes the total land area cultivated by upland rice farmer respondents is equivalent to 327.45 hectares. As to the tenurial status of upland rice farmers in Cagayan province, most of them are owners tilling about 68.84% of the total land area devoted to upland rice with an average landholding of 1.27. About 19.24% of the total land area are cultivated by settler farmers, with a mean cultivated area of 1.17 hectare. The lease tenants are cultivating a total of 25.13 hectares with a mean of .75 hectares. The settler farmers are also tilling a total land area of 62.88 hectares with an average landholding of 1.17 hectare. or 7.81% of the total land area cultivated with a mean of .93 of a hectare while the amortizing owners are cultivating 2.41% of the total land area with a mean area of .86 of a hectare, share tenants are cultivating 1.17% of the total upland land area cultivated with a mean of .63 of a hectare and the least are public lands with a total of 1.75 hectares which is .5% of the total land area with a mean area of .88 of a hectare. The upland rice farmer respondents are tilling an average land area of .96 a hectare or 9,600 square meters meaning that upland rice farmers are tilling less than a hectare. Upland rice farmers limit the area they cultivate due to the risk most often experienced by them like insufficiency of rain water and long drought.

As to the topography of farms tilled by upland rice farmer respondents, 41.75% or 136.70 hectares are

hilly, 36.05% or 118.15 hectares are flat, while 22.17% or 72.60 hectares are undulating. These areas cultivated by upland rice farmers are depending to rain to sustain the water requirements of their rice crops.

The farmer respondents are tilling varied soil type of upland rice farms, 38% or 122.7 hectares are classified as loam, 33% or 107.85 hectares are sandy loam, 23% or 74.35 hectares are clay loam and 6% or 17.8 hectares are clay. Most (80.60%) of them operate in just a single cropping season while the rest (19.40%) are operating flat in topography for two cropping seasons in a year. Most of them or 80.60% practice single cropping per year in time of the wet season (June-October).

**Table 2.** Farm and Farming Characteristics in upland rice cultivation.

Land Tenurial Status	Total Area (in hectare)	Percent	Mean Landholding
Owner	221.45	68.84	1.27
Amortizing owner	7.75	2.41	.86
Share tenant	3.75	1.17	.63
Lease tenant	25.13	7.81	.93
Settlers	62.88	19.24	1.17
Public land	1.75	0.5	.88
Total	322.7	100	
<b>Topography</b>			
Flat	118.15	36.08	1.1934
Undulating	72.60	22.17	1.1344
Hilly	136.70	41.75	1.1024
Total	327.45	100	
<b>Soil Type</b>			
Clay	17.8	6	.25
Loam	122.7	38	3.00
Clay loam	74.35	23	.00
Sandy loam	107.85	33	14.00
Total	322.7	100	
<b>Number of Cropping</b>		Area	Percent
Once	260.1	80.60	
Twice	62.6	19.40	
Total	322.7	100	

\*Multiple response

#### *Farm Financing Practices*

Most (73.3%) of the upland rice farmer respondents use their own money to finance their farm operation, 7.8% resorted borrowing from traders, 5.3% from friends, 3.7% from relatives, 2.3% from banks, 2% from agricultural supplier, 0.7% from cooperatives.

These data indicate that farmers prefer to invest their own money and to borrow from informal money lenders due to ease in processing and accessibility. While 17 or 5.7% received government subsidies. Of the 220 farmer respondents who decided not to borrow money have the following reasons; all (100%) of them said "have savings", 43.64% said "fear of inability to pay due to low harvest", 27.27% of them are discouraged to borrow money because of "high interest rate". About 39 of the 269 farmer respondents revealed to have availed cash subsidy from the Department of Agriculture with a mean of Php 1,065 -and a standard deviation of Php 344.00. While the same farmers received subsidy in kind like rice seed subsidy of an average of 31.76 kg and a standard deviation of 10.15 kilogram.

**Table 3.** Sources of upland rice farming capital, reasons of not borrowing and subsidy availed.

Sources	Frequency	Percent
Own money	220	73.3
Trader	21	7.8
Agricultural supplier	6	2
Bank	7	2.3
Cooperative	2	0.7
Relatives	11	3.7
Friends	16	5.3
Government subsidy	17	5.7
Reasons of not borrowing money	Frequency	Percent
Fear of inability to pay due to of low harvest	96	43.64
High interest rate	60	27.27
Have savings	220	100
Total		
Multiple response		
Amount of subsidy availed	Frequency	Percent
500.00	6	15.4
700.00	11	28.2
1300.00	9	23.1
1360.00	13	33.3
Total	39	100.0
Mean = 1065.88		
Std. Deviation = 344.00		
Seed subsidy in kilogram	Frequency	Percent
20	17	43.55
40	22	56.45
Total	39	100

Mean = 31.76 Std. Deviation = 10.146.

To those who borrowed money from traders, they were able to borrow an average amount of Php 7,666.67.00 payable for an average of 4.7 months with an interest rate of 4.4 percent per month. Similarly and average amount of Php 4,250.00 was disclosed to owed from the agricultural supplier payable within an average of 5.83 months with 4.40 percent interest rate. Moreover, those who borrowed from banks, were able to avail an average amount of Php 12,000.00 with an interest rate of 2.5 percent payable for an average of 5.5 months. Those who borrow from cooperatives were able to borrow Php 40,000 payable in 5.5 months with a monthly interest of 2.5 percent. While those who borrow from relatives were able to avail an average amount of Php 4,996.36 payable in 5.1 months with 8.23 percent monthly interest rate. They also borrowed from friends amounting to Php 7,310.34 with a maturity period of 4.97 months and an interest rate of 8.36 percent.

It can be gleaned from the data that banks and cooperatives as formal money lenders offer the lowest interest rates while relatives and friends offer the highest interest rate. However, farmer respondents preferred to borrow money from informal money lenders to be free from documentary requirements, more accessible and immediate availment.

#### *Cultural management*

There are 44 rice seeds locally named by upland rice farmers suitable to upland rice growing used by the respondents, the top ten utilized upland rice seeds for planting are; Aringay (65), Palawan (34), Burdagol (28), Calagan (24), Papsal (24), Mindoro (20), Tang-tang (18), Lampadan (16), Gobyerno (15), Black rice (12), Red rice (12). Moreover, the reasons of the upland rice farmers in their choice of seeds to plant are; "Only available seed", "Good eating quality and aromatic", "High yielding", "Good for upland farm", "Traditional variety", "Resilient to drought", "Bigger grains", "Provided by Dept. of Agriculture" and "For testing".

**Table 4.** Amount of money borrowed from different sources, interest rate, principal payment and interest payment.

Sources	Descriptive Statistics	Principal amount	Maturity in months	Percent Interest per month	Percent Interest per cropping season	Principal payment	Interest payment
Trader	Mean	7,666.67	4.70	4.40	22.00	7,666.67	1,688.57
Agri supplier	Mean	4,250.00	5.83	4.40	25.65	4,250.00	935.00
Bank	Mean	12,000.00	6	2.5	15	12,000.00	800.00
Cooperative	Mean	40,000.00	5.5	2.5	13.75	40,000.00	5,500.00
Relatives	Mean	4,996.40	5.1	8.23	41.97	4,996.40	2,096.97
Friends	Mean	7,310.30	4.97	8.36	41.55	7,310.30	3,037.40

**Table 5.** Top ten locally named Upland rice seeds planted by farmer respondents and reasons of planting.

Variety	Reason of choice of variety									Total
	Only available seeds	Good eating quality and aromatic	High yielding	Good for upland farm	Traditional variety	Resilient to drought	Bigger grains	Provided by Dept. of Agriculture	For Testing	
Aringay	8	23	8	9	4	0	2	3	8	65
Palawan	1	6	7	5	6	1	3	2	2	33
Burdagol	1	5	7	4	2	8	0	0	1	28
Calagan	7	5	2	3	3	0	2	0	2	24
Papsal	3	7	4	4	0	0	6	0	0	24
Mindoro	6	3	3	2	4	0	1	0	1	20
Tang-tang	0	9	2	2	1	1	0	0	1	16
Lampadan	2	8	1	5	0	0	0	0	0	16
Gobyerno	2	7	1	1	1	1	2	0	0	15
Red Rice	0	10	0	1	0	0	1	0	0	12
Black Rice	0	7	4	0	0	0	0	0	1	12
Total	30	90	39	36	21	11	17	5	16	265

\*Multiple responses

Table 6 presents the cultural management employed by respondents in their upland rice cultivation. All of the respondents revealed to use rice seeds suitable for upland growing with a mean quantity of 83.31 kilograms per hectare and a mean cost of Php 2,082.75. Only one fourth (25.65%) of them revealed to have practice manual first plowing and 19.40% used mechanical first plowing with an average cost incurred of Php 1,955.36 employing manual first plowing while an average cost of Php 2,748.89 per hectare using mechanical plowing. There were 9.67% practice manual second plowing and 4.46% practice mechanical second plowing with an average cost per hectare of Php 2,289.23 and Php 1,570.18 respectively. There were also 14.13 percent practiced manual first harrowing and 3.35 practiced mechanical harrowing. On the other hand, .37 percent practice manual second harrowing and mechanical second harrowing. While the same .37 percent practice manual levelling and mechanical levelling. While 16.73 percent practice manual burning and .37 practice mechanical burning.

Most (74.35%) of the respondents apply chemical weedicide before planting, while 16.73% of them practice burning of hay and weeds before planting. Whereas, 25.65% of the respondents practice manual first plowing method, only 11.52% used mechanical method, 9.67% practice manual second plowing while 4.46% on mechanical method, 12.28% practice manual first harrowing, 3.35 used first mechanical harrowing, .37% used both manual and mechanical second harrowing, .37% employed mechanical rotavating while .37% both practice manual and mechanical levelling. All of the farmers employed direct seeding method, majority or 64.31% practice seed drilling, 37.11% used dibbling method while 11.15% practice broadcasting. All of them claimed to have practice thinning of seedlings at 2-3 weeks after sowing.

As to the nutrient management, more than one fourth (26%) of the respondents practice basal fertilizer application using inorganic complete fertilizer with a mean quantity of 101.32 kilograms and a mean cost of Php 820.51.

To the 29.4 present farmers who practice first sidedress fertilizer application, they applied inorganic urea with an average quantity of 45.22 kilograms with mean cost of Php 737.75 while there are 70.6 percent who did not apply. Only 3.8 present of the farmers apply second sidedress fertilizer using urea with an average quantity of 45 kilograms and a mean cost of Php 825.00. Moreover, there were 7.9 percent who applied inorganic foliar fertilizer with an average volume of 531.56 ml and a mean cost of Php 628.6, there were 92.2 percent who did not apply.

There are also 7.9% who practice foliar fertilizer application, 4.5% used "Greenbee", 2.2% used "Crop Giant", 8% used "Lathem Gas" and 4% used MRJ Mega Grower Fertilizer. There are 92.2% who did not apply foliar fertilizer. On weed management practice, around 234 or 86.99% apply chemical weedicide like "2-4-D" by 33.83%, "Mower" by 15.61%, "Power" by 14.15%, "Clear Out" by 11.90%, "Spitfire" by 3.72%, "Almix" by 1.5%, "Triple 8" by 1.5%, "Ammonium Salt of Glyphosate" by 1.2%, "Quadro 8" by 1.1%, "Grader" by .7%, "G Ramoxone super" by .7%, "Pyzer" by .4% and "Weedbuster" by .4%. The farmers used an average quantity of 320ml and 5.4 grams. The average cost incurred is Php 454.03 and Php 1,159.97 respectively. However, only few (13%) did not apply chemical weedicide.

There are 179 or 66.7% who applied chemical based insect and disease control, 23.4% used "Cymbush", 23% used "Magnum", 9% used "Lannate", 2.2% used "Express", 1.1% used "Brodan", .4% used "Malathion", "Mower", "Prevathon", "Terminator", "Viper", and "Breaker". With a mean quantity of 1.33 liter Php 141.66. While 33.5% did not apply chemical insect and disease control. 1,000ml with an average cost incurred of. Php 2,400 respectively.

Only 3 or 1.2% of the respondents practice Integrated Pest Management (IPM) who personally prepared their organic formulation, 1 or .4% mixed "1 kilo of minced garlic and 1 kilo of minced pepper, soaked in water for 1 week", another 1 or .4% practice "tire burning" while 1 or .4% prepared "fermented ginger,

chili with breeze powder). All these 3 respondents who practice IPM revealed to apply every other day starting from flowering to panicle initiation.

As depicted in the succeeding table, the respondents practice pure manual harvesting where 59.48% use "rakem or harvest knife" while 40.5% used scythe. All (269 or 100%) sun dry their upland rice produce. Almost all (99.26%) of the respondents left produce for their home consumption while 19 of them sell their products as milled at an average price of Php 43.79, there are 51 of them sell their products as dry palay at an average price of Php 19.99 and 13 of them sell as fresh at an average price of Php 12.75. This table presents the harvesting and post-harvest practices of upland rice farmer respondents, manual harvesting was done from .5 – 30 days with a mean of 31.6. Labor cost per unit incurred range from Php 57.14 to Php 4,000 with a mean of Php 233.51 and a standard deviation of Php 247.86. Average total cost for labor range from Php 400 – 36,000 and a mean of Php 5,342.47. Mechanical harvesting on the other hand, range from 1-8 days with a unit cost ranging from Php 2,400 to Php 28,900 with a mean of Php 12,153.82.

Manual threshing was also done with a mean number of 2.64 days, with an average cost of Php 215.70, and an average total cost of Php 1,853.40. Mechanical threshing was done in an average of 1 day with an average unit cost of P1,163.89 while average total cost incurred is Php 1,883.33.

Manual drying was done in 1-30 days with a mean of 1.94 days. The average unit cost incurred in solar drying is Php 219.85 while the total cost of Php 200.00-6,000.00 with a mean of Php 1,028.30. There were 18.96% of the farmer respondents who sold their rice produce to traders while 3.3% of them sold to the market, relatives, friends and convenience store near them. There are 40% of them sold their products as fresh palay at an average price of Php 12.75, 85% of them sold as dry palay at an average price of Php 18.00 and 31.67% of them sold as milled rice at an average price of Php 43.79.

**Table 6.** Cultural Management.

A. Land Preparation Practices	Manual	Mechanical	Mean quantity of input utilized	Manual	Mechanical
	Percent	Percent		Cost	Cost
Seeds	100		83.31 kg	2,082.75	
A.1 First Plowing	25.65	19.40		1,955.36	2,748.80
A.2 Second Plowing	9.67	4.46		2,289.23	1570.18
A.3 First Harrowing	14.13	3.35		1295.45	686.73
A.4 Second Harrowing	.37	.37		1,500	500
A.5 Levelling	.37	.37		1,200	800
A.6 Burning	16.73	.37		3,070.6	
B.Planting Practices					
B.1 Direct Seeding Method	100				
A,Dibbling	37.77				
a. Drilling	64.31				
b. Broadcasting	11.15				
Thinning (2-3 weeks after sowing)	100				
C. Nutrient Management Practices	Manual	Mechanical	Mean quantity of input utilized	Cost	Cost
C.1 Basal Application					
Inorganic fertilizer (Complete)	26.0		101.32	820.51	
Did not apply	74.0				
C.2 First Sidedress Application					
Inorganic (Urea)	29.4		45.22	737.75	
Did not apply	70.6				
C.3 Second Sidedress Application					
Inorganic (Urea)	3.8		45	825.00	
Did not apply	96.3				
C.4 Foliar Fertilizer Used					
Inorganic (ml)	7.9		531.56	628.63	
Did not apply	92.2				
C.5 Weed Management				Chemical	
Inorganic (ml)	86.99		320	454.03	
(Gram)			5.40	1,159.97	
Did not apply	13.0				
C. Nutrient Management Practices	Manual	Mechanical	Mean quantity of input utilized	Cost	Cost
C.1 Basal Application					
Inorganic fertilizer (Complete)	26.0		101.32	820.51	
Did not apply	74.0				
C.2 First Sidedress Application					
Inorganic (Urea)	29.4		45.22	737.75	
Did not apply	70.6				
C.3 Second Sidedress Application					
Inorganic (Urea)	3.8		45	825.00	
Did not apply	96.3				
C.4 Foliar Fertilizer Used					
Inorganic (ml)	7.9		531.56	628.63	
Did not apply	92.2				
C.5 Weed Management				Chemical	
Inorganic (ml)	86.99		320	454.03	
(Gram)			5.40	1,159.97	
Did not apply	13.0				
D. Insect and Pest Management					
Chemical (liter)	66.7		1.33	141.66	
Organic (IPM) (ml)	1.12		1,000	2,400	
Did not apply	33.46				
D. Harvesting	Percent	Percent		Cost	Cost
Rakem (harvest knife)	59.5		10 manday	5342.47	
Scythe	40.5		10 manday	5342.47	
Mechanical					2,400
E. Threshing	36.43	63.57	10 manday	1853.40	1883.33
F. Drying					
Solar drying	100		2 manday	1028.30	



A. Land Preparation Practices	Manual	Mechanical	Mean quantity of input utilized	Manual	Mechanical
	Percent	Percent		Cost	Cost
G. Product Disposal	Percent				
Trader	85.0				
Others(market, relatives, friends and store)	15.0				
G.1 Forms of Product Sold	Percent				
Fresh	14.87				
Dry	18.96				
Milled	7.06				
H. Price of Rice Products Per kilogram					
Average price of fresh palay sold	Php 12.75				
Average price of dry palay sold	Php 18.00				
Average price of milled rice sold	Php 43.75				

Table 7 presents the average quantity of inputs utilized by upland rice farmers with their corresponding costs. Employing the manual method of land preparation, first plowing was done for an average of 2.12 days with an average unit cost of Php 418.41 and an average total cost of Php 1,955.36. Second manual plowing was done in an average of 1.35 days, an average unit cost of Php 4,885.38 and an average total cost of Php 2,289.23. On the other hand, first manual harrowing was done in 1.89 days with an average unit cost of Php 409.10 and an average total cost of Php 1,295.00. Second manual harrowing was only practiced by single farmer in one day with a cost of Php 500.00. Same with manual levelling it was also done by 1 person with a cost of Php 400.00.

The farmer respondents planted 44 varieties of upland rice of their choice which according to them were chosen based on the availability of seeds for planting; Aringay is the most preferred among the available variety planted, followed by Palawan, Burdagol, Papsal, Calagan, Mindoro, Tang-tang, Gobyerno, Lampadan, Black rice, Sidingan, Red rice, Pinilisa, Camurus, C1, Wag-wag, Balatinao, Binirhen, Azucena, Gorgoryo, IR42, Makapilay Pusa, Milagrosa, Raminan, Trio-2, Apog, Balsamo, Bilog, Burburyu, Burik, C18, Inapugan, Japaniri Rice, Lubeg, Makaali, Malagkit, Mestisa, NC2, Pampanga, Patek, Ricabu and Taiwan.

Dry seeding planting method employed by the respondents required an average quantity of 38.31 Kilograms, planting was done at an average of 1.6

days. The average unit cost incurred in planting is P219.50 and an average total cost of Php 3,070.59.

The respondents applied basal fertilizer in manual method with a minimum of 25 kilograms and a maximum of 700 kilograms with a mean of 108.94 kilograms. Fertilizer application was done manually for an average of 1.57 days with an average unit cost of Php 223.45 and an average total cost of Php 820.

First sidedress fertilizer applied using manual method utilized a minimum amount of 1.5 kilogram and a maximum of 600 kilograms with an average quantity of 104.47 kilograms. Manual first sidedress fertilizer application was done in .5-3 days with a mean of 1.14 day. The labor cost per unit incurred is as low as Php 100.00 and a maximum of Php 300.00 per day with a mean of Php 225.57. Total cost incurred is at the minimum of Php 100.00 and a maximum of Php 4,000.00 with a mean of Php 737.75.

In the second manual sidedress fertilizer application, farmers utilized a minimum amount of 25 kilograms applied in 1 day and a maximum of 200 kilograms applied in 4 days and a with a unit cost of Php 200-250 and a total cost of Php 250-1,000 with a mean of Php 825.00.

Foliar fertilizer used by farmers were also applied manually, they are purchased in liquid and powder forms. Powder foliar fertilizer were purchased with an average of 531.36 grams. While liquid foliar fertilizer formulation used at an average of 2.31 liters. Foliar fertilizers were applied in an average of 1.25 days.

Labor cost incurred in the application is at the average of Php 194.34 and an average total labor cost of 628.

The average price per liter of a chemical weedicide is at Php 328.29 while an average price per pack of 25 grams is Php 177.00. While manual weeding practices of farmer respondents were done in an average of 3.17 days. The labor cost per day is at the average of Php 215.70.

Chemical Insecticide and disease control used by farmers are in two formulation, liquid and powder. In the liquid form, the farmers utilized a mean of 1.33 liters, while in powder form is at the average of 245.38 grams. Price per liter was at a mean of Php 380.51. While price per pack is at an average price of Php 88.68. Chemical insecticides and disease control was purchased at an average unit cost of Php 380.51 per liter and Php 88.68 average unit cost per pack in 25grams. Those who practice Integrated Pest Management (IPM), prepared their own formulation claimed to have incurred an average unit cost of Php 200.00 per liter with an average total cost of Php 750.00. Farmers applied the organic pest and disease control with an average of 10.50 days with a labor cost incurred of Php 141.66. Manual harvesting on the other hand, was done from in an average of 31.6. Labor cost incurred was at an average of Php 233 per day.

In mechanical harvesting an average total cost of Php 12,153.82 was incurred while manual threshing was done with a mean of 2.64 days, an average unit cost of Php 215.70 an average total cost of Php 1,853.40. Mechanical threshing was done in an average of 1 day with an average unit cost of P 1,163.89. Manual drying was done in an average of 1.94 days with an average unit cost of Php 219.85 and a mean total cost of Php 1,028.30. Findings reveal that most of the upland rice farmer respondents did not apply any kind of fertilizer, insecticides, pesticides and disease control. However, most of them apply chemical weedicides. Moreover, to the few farmers who apply fertilizers, insecticides and disease control, they rely on inorganic and chemicals. It has been noted however, that upland rice farmers limit their

investments on production inputs due to the erratic weather condition as high risk associated to upland rice farming which they consider it a gamble.

**Table 7.** Average quantity of inputs utilized with corresponding costs in production.

Quantity	Mean	Average Cost
Seeds in kilogram	83.31	28.43
Land preparation		
Mechanical (day)		
First Plowing	.94	1714.52
Second plowing	.92	1283.33
First Harrowing	1.44	766.67
Second Harrowing	1.0	500.00
Levelling	1.0	800.00
Manual (mandays)		
First Plowing	1.35	485.38
Second Plowing	1.89	409.09
First Harrowing	1.0	400.00
Second Harrowing	1.0	500.00
Levelling		
Planting		
Dry seeding planting	38.31	22.00 per kilogram
Mandays in planting	1.6	219.50
Fertilizer in kilogram		
Basal (Complete)	101.32	820.51
1 <sup>st</sup> Sidedress (Urea)	115.22	737.75
2 <sup>nd</sup> Sidedress (Urea)	95	825.00
Foliar Fertilizer (ml)	531.56	628.63
WEED MANAGEMENT		
Weedicide		
Liters	320	328.29
Grams	5.40	454.03
Manual Weeding (mandays)		
Insect and Disease Management		
Insecticide (liters)	1.33	380.51
IPM (liters)	1,000	750.00
Harvesting		
Manual(manday)	3.56	5342.47
Mechanical	2.64	12153.82
Threshing		
Manual (manday)	1.26	1853.40
Mechanical	1.0	1883.33
Drying		
Manual	1.98	1028.30

Table 8 demonstrates the gross yield generated by all farmer respondents according to variety grown. The distribution of products are also presented i.e. the harvester-thresher share, land rental, home consumption, quantity sold and yield in tons per hectare with papsal variety recorded the highest yield performing variety of 3 tons, while Makapila was recorded to yield the lowest with .69 of a ton or 690 kilograms per hectare with a mean yield of 1.3 ton per hectare.

**Table 8.** Gross yield and distribution.

Item	Gross Yield			Harvester/Thresher Share		Land Rental (kg)	Home Consumption (kg)	Sold (kg)	Yield per hectare in ton
	Area (ha)	Manual (kg)	Mech (kg)	Manual (kg)	Mech (kg)				
Apog	1.25	1450		115			1335		1.16
Aringay	51.88	88877		5228			73460	10891	1.71
Azucena	1.0	1060		125			975		1.06
Balatinao	8.0	8560		250			7260	1050	1.07
Bilog	0.5	2000		250			1750		4.0
Binirhen	4.0	3496		124			3362		.87
Black rice	9.35	14550	3000	975	250	108	6217	4000	1.88
Burburyu	2.0	3000		550			2450		1.5
Burdagol	21.95	34358		1842		1100	27291	4125	1.6
Burik	0.5	1080					550	530	2.2
C1	6.75	6580		400		168	5832	180	.97
Calagan	19.75	37,630		9,353			2,400	21,000	1.9
Gobyerno	7.88	9086		137			7683		1.15
GSR8	0.5	1000					1000		2.0
Inapugan	0.25	600					600		2.4
IR42	1.85	1649					754	895	.89
Japaniri rice	5.5	6,480		1350			1,950		1.2
Kamurus	12.0	21101		171			17020	3910	1.76
Lampadan	17.25	23580		1360		100	20870	1250	1.4
Lubeg	2.0	3500					3400	100	1.75
Makapila	1.5	1040					1040		.69
Malagkit	0.2	332					32	300	1.67
Mestisa	2.0	2000		150			1350	500	1.0
Milagros	2.0	2106					2106		1.05
Mindoro	9.9	20848		2399		50	18399		2.1
Palawan	37.8	53284	6000	7247	1500	400	28427	9710	1.6
Pampanga	1.0	2250					1350	900	2.3
Papsal	35.53	77719	30400	2525	7361	3118	31621	26942	3.0
Patek	0.3	432		50			150	232	1.3
Pinilisa	2.25	6125		1458			1417	3250	2.7
Raminan	0.75	1040					1040		1.4
Red rice	23.5	15781	1740	1335	350		10946	1410	.75
Reppeng	6.25	8284	1500	550	525	1318	791	3600	1.6
Ricabu	1.25	2750		450			2300		2.2
Sidangan	2.25	6165		1378			4667	120	2.7
Taiwan	.5	945		181			656	108	1.9
Tang Tang	14.0	36550		1361	225		30314	4650	2.6
Wag-wag	1.5	1500		100			1400		1.0

\*Mean Yield in ton = 1.3 ton per hectare

#### *Benefits in Upland Rice Farming*

Farmers assessed upland rice farming as an environmentally safe and healthy farming practice compared to lowland farming where heavier application of inorganic fertilizer and chemicals are being practiced. All (100%) of them believed that upland rice farming has “less additives”, 96.3% said it “reduced pollution”, 95.5% claimed it has a “better eating quality” 92.2% considered to “improve air quality”, 89.2% assumed to have “less

pesticide contamination” 88.5% believed to improve soil quality”, 81.8% “improved air quality” and the rest also expect as “disease and pest resistant”(37.2%), “reduced weed competitive” (26.8%), “cures high blood”(25%), “low cost of production”(25%), “protection to disease”(25%) and “suitable to climate change”(25%). According to them application of inorganic fertilizer and chemical based weedicides, pesticides and insecticides are of lesser quantity.

**Table 9.** Benefits of upland rice farming by the respondents.

Benefits	Frequency	Percent
Less pesticide contamination	240	89.2
Less food additives	269	100.0
Reduced pollution	259	96.3
Improved air quality	248	92.2
Improved water quality	220	81.8
Improved soil quality	238	88.5
Better eating quality	257	95.5
Disease and pest resistant	100	37.2
Reduced weed competitive	72	26.8
Cure High blood	1	25.0
Low cost of Production	1	25.0
Protection to disease	1	25.0
Suitable to climate change	1	25.0

The following are the most pressing problems experienced by all (100%) of the upland rice farmers;

“High prices of farm inputs”, “Lack of farm machinery for upland farming use and to transport products”, “Laborers are less willing to work in upland rice planting and harvesting due to hard soil”, “Low yield and low harvester-thresher share”, “Hard to schedule planting due to unpredictable onset of rain”, “Takes longer time to plant due to hard soil and process of upland rice planting”, “Drought”, “The soil is hard to plow”, “Lack of mechanical Dryer”, “Unwillingness of laborers”, “Lower yield compared to lowland rice”, “Low price of upland rice ,same price with ordinary rice resulted to low net income”.

**Table 10.** Problems and recommended solutions in upland rice production.

Item	Problems	Farmers suggested Solution	Frequency	Percent	Rank
Farm Inputs	High prices of farm inputs	Financial support or assistance	269	100	1
	Lack of upland rice seeds for planting	Government should provide farmers the information of upland rice seeds for planting	28	10.41	
	Lack of farm machinery for upland farming use and to transport products	Government loan for farm implements	269	100	1
Labor	High labor cost	Regulate labor cost	56	20.82	
	Laborers are less willing to work in upland rice planting and harvesting due to hard soil, low yield and low harvester-thresher share	Technology to facilitate land preparation, planting, harvesting and threshing	269	100	1
	Hard to schedule planting due to unpredictable onset of rain	Upland rice planting calendar be established by DA	269	100	1
Planting and planting schedule	Takes longer time to plant due to hard soil and process of upland rice planting	POT to facilitate upland rice planting	269	100	1
	Soil and Irrigation Power	Drought	DA provides Deep well for the upland rice farmers.	269	100
The soil is hard to plow		DA provides tractor for the upland farmers.	269	100	1
Pests and diseases	Rodents	Applying Black Arsenate	39	14.5	
	Birds	Installing of trap for the birds	4	1.49	
	Pests and insects attack	Applying insecticides	72	26.78	
Harvesting	Lack of mechanical Dryer	Provision of mechanical dryer by DA	269	100	1
	Unwillingness of laborers	Mechanical planter and harvester for upland rice	269	100	1
	Lack of mechanical thresher	Mechanical thresher to be loaned from DA	10	3.7	
	Lack of Transport facilities of harvested rice	Improved roads connecting upland rice areas to market	110	40.90	
Calamities	Drought	Support from the DA(Dep well)	269	100	1
	Landslide	Improve roads	30	11.15	
	Typhoon	None	269	100	1

Item	Problems	Farmers suggested Solution	Frequency	Percent	Rank
Technical and other farming related assistance	Untitled cultivated land	Government assistance to title lands	53	19.70	
	Hard to remedy land amortization payment to Land Bank	No interest	4	1.49	
Financial capital	High Interest on Borrowed Capital	Government loan at low interest and less requirements	63	23.42	
	Lack of capital	Farm inputs government subsidy	121	44.98	
Yield	Lower yield compared to lowland rice	Development of upland rice high yielding variety	269	100	1
Marketing cost and return	Low price of upland rice, same price with ordinary rice resulted to low net income	Government support price to upland rice	269	100	1

### Conclusion

The study was conducted to ascertain the cultivation practices of upland rice farmers in Cagayan province, Philippines. Findings show that upland rice farmers are in their middle age, speak Iloko, lowly educated with some who did not seek formal schooling, with a family size of 5, with one third female participation in the operation. Only few are members of organization and attended trainings provided by government line agencies in their respective barangays and municipalities. Most of them are owners tilling less than a hectare. Upland rice areas are hilly with "loam" soil type operated once a year. Farmers self-financed their operation for fear of high interest rates and inability to pay due to low harvest. Informal money lenders offer more than three times the interest rates in banks and cooperatives but farmers still prefer to borrow for ease of requirements, accessibility and immediate release.

Meanwhile, Upland rice farmer respondents in Cagayan planted 44 varieties of upland rice of their choice and based on its availability. Few practice manual and mechanical plowing and burning while most of them practice chemical weedicide application before planting. Direct seeding method employing dibbling, drilling and broadcasting, thinning of seedlings follows after 2-3 weeks after sowing. Most of them did not apply any type of fertilizer in their basal, first sidedress, second sidedress and foliar application. Those who applied utilized inorganic fertilizer. Most of them applied heavy chemical weedicides, very few practice IPM.

They also use chemical insecticides and disease control. Costs incurred in the operation is at the minimum, yield is at the average of 1.3 ton per hectare. Harvesting is done traditionally using rakem (harvesting knife) and scythe, products are sun dried and sold as dry palay to traders. Farmers identified various benefits in upland rice farming. Varied problems are experienced by all (100%) of the upland rice farmers with their recommended solutions.

### Recommendations

Basing from the conclusion of the study, the following are hereby offered: (1) More intensified promotion of the RA 10068, promotion and technical assistance on the improvement and development of high yielding and more resistant upland rice varieties to rodents, insect and pest infestation; (2) Program to ease the burden of upland farming operation i.e. land preparation, planting, harvesting and transporting of products; (3) Program to provide water supply to upland rice lands; (4) Government assistance to upland rice farmers in the titling of their lands; (5) Bring credit program service to the barangays to really assist the farmers; (6) Government support price to upland rice.

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