Expanded Value Chain Analysis of Heirloom Rice in the Cordillera Administrative Region (CAR)

HEIRLOOM RICE PROJECT

DEPARTMENT OF AGRICULTURE 1898

Department of Agriculture
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PREFACE

Heirloom Rice refers to the rice seeds that have been passed from generation to generation in the Cordillera Administrative Region (CAR). They are part of the culture and heritage of its peoples, gaining value over time. They are the heart and essence of its terraces and a testament to the hardiness and resilience of the rice grain. The Heirloom Rice Project (HRP) was motivated by the desire to conserve these precious seeds, cognizant of their inherent traits and qualities. Selected heirloom rice varieties are now known to be more nutrient-dense than the more prevalent varieties that are available. Recent interest in nutrition has elevated heirloom rice's status as a specialty rice, commanding higher prices in local and global markets. This contributes to the sustenance and productivity of the heirloom rice farmers, providing a way for them (majority of whom are now female) to survive and thrive despite the harsh farming conditions in the Cordillera mountains.

Funded by the Department of Agriculture (DA) - Bureau of Agricultural Research, Phase II of the HRP entitled, "Conserving and Increasing Productivity and Value of Heirloom Rice in the Cordillera" follows from Phase I's "Raising Productivity and Enriching the Legacy of Heirloom Rice through Empowering Communities in Unfavorable Rice-Based Ecosystems". The HRP primarily aimed to improve the livelihood of the indigenous peoples in the Cordilleras by significantly increasing the productivity and marketability of desired rice varieties. This vision is shared among the partner institutions, namely the International Rice Research Institute (IRRI), the DA - Regional Field Office of CAR, and the Philippine Rice Research Institute.

The strategies implemented to fulfill this vision are two-fold: 1) to increase farmers' income and food security; and 2) to conserve and sustain the heritage of the Cordillera rice terraces. The project's objectives are a) to ensure preservation and community registry of the characterized heirloom rices; b) to establish the inherent characteristics of at least 150 heirloom rices in the expansion sites; c) to increase the volume of quality milled heirloom rice by at least 10% through improved production and postharvest production management; d) to capacitate implementers and producers for improved productivity and product quality; and e) to increase the value of heirloom rice and ensure market competitiveness.

For HRP Phase II, IRRI was directly responsible for 1) the *in-situ* and *ex-situ* morpho-agronomic characterization, genotyping, and grain quality analyses; 2) field trials on pest management strategies; and 3) piloting of postharvest production technologies. In addition, the expanded heirloom rice value chain analysis is IRRI's contribution to maximize the full potential of heirloom rice as a prime commodity when it is sold either as grain or as other rice by-products.

This report forms part of a set of HRP Phase II's research reports on the environmental, economic, social, and health aspects of heirloom rice cultivation in the Cordillera region. We hope that it will provide not just information but also inspiration for research managers, scientists, researchers, farmers, and all stakeholders to build on the lessons learned from the HRP and contribute to the sustainability and productivity of heirloom rice.

ACKNOWLEDGEMENT

The Heirloom Rice Project (HRP) Phase II is a multi-level and multi-disciplinary research collaboration among government, the academe, entrepreneurs, and the indigenous peoples of the Cordillera Administrative Region (CAR), together with scientists and researchers from national and international institutions. We would like to thank all the men and women who contributed to the project's fulfillment.

We are so thankful to our partners from the provincial heirloom rice cooperatives and local governments of Mountain Province, Kalinga, Ifugao, and Benguet for facilitating the selection of participants and respondents and closely monitoring the conduct of the focus group discussions and individual farmer interviews. It was a pleasure to feel so comfortable and relaxed in a community so closely knit. In this connection, we recognize Ms. Rowena Gonnay (Pasil, Kalinga), Ms. Jovita Camso (Bontoc, Mountain Province), Mr. Alfonso Cayong (Hungduan, Ifugao), and Mr. Ramon Calde (Bauko, Mountain Province) for their assistance during the conduct of the field activities. In addition to the people who had supported HRP from the start to Phase ll, and to name a few Mr. David Kimmayong, Ms. Melanie Lagasca, MA in Besao and in other municipalities.

We acknowledge our partners from the Department of Agriculture - Regional Field Office of CAR for planning and coordinating the field works in the four provinces. We would like to thank Ms. Reina Cardona, Ms. Jean Mayos and Ms. Daisy Caysoen from the Agribusiness and Marketing Assistance Division (AMAD) and Ms. Jenny Dayao and Ms. Sarah Balloyan from the Research Division for helping us in conducting the research activities. We also recognise Ms. May Ann Tuba-ang for helping in the additional requests necessary to complete the field activities.

The HRP-IRRI team led by Dr. Cecilia S. Acuin and Dr. Ana E. Cope who both provided technical support, guidance and coordination works; Ms. Phoebe B. Ricarte, Eng. Joseph Sandro, and Ms. Joyce S. Luis in carrying out the field work, analysis, and write-up of the reseach on value chain analysis (VCA); and Dr. Matty Demont for providing direction and technical advice on how to proceed with the VCA method. To Dr. Magdalena Wanawan, Dr. Virginia Tapat, Ms. Veron Fang-asan, and all DA-RFO CAR partners for providing vital information and logistical coordination.

We wish to express our gratitude to the DA National Rice program through Bureau of Agricultural Research for the three-year grant, from 2017 to 2020, that made it possible for HRP Phase II to achieve its accomplishments.

This acknowledgement would not be complete without mentioning Dr. Casiana M. Vera Cruz who instigated the launching of the HRP project at IRRI in 2014 and led both HRP Phases I and II until her retirement in 2017. She paved the way for reaching out to the heirloom rice farmers and local partners. Though retired from IRRI, she maintains her solicitude for the Cordillera farmers and the people she talked to or worked with during the project. We wish to thank her for her enthusiasm, passion, and profound understanding.

We remember as well Dr. Gelia Castillo for her love for heirloom rice and deep concern for heirloom rice farmers. She once told the HRP team "I want to meet them (farmers) and ask, 'did you make money from heirloom rice?' If they say yes, I'll be very happy. But if no, I'll go after you".

We dedicate this report, one of HRP Phase II's products, to the men and women farmers who live for and because of heirloom rice. May the lessons learned and gained from the HRP be passed on, like heirloom rice grains, to the generations of farmers to come.

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List of acronyms

AMAD	-	Agribusiness and Marketing Assistance Division
BHRFAC	-	Benguet Heirloom Rice Farmers Agricultural Cooperative
CAR	-	Cordillera Administrative Region
COD	-	Cash on delivery
DA	-	Department of Agriculture
DA-RFO CAR	-	Department of Agriculture Regional Field Office, CAR
DTI	-	Department of Trade and Industry
FGD	-	Focus Group Discussion
GDP	-	Gross Domestic Product
HRP	-	Heirloom Rice Project
IHRPC	-	Ifugao Heirloom Rice Producers Cooperative
IRRI	-	International Rice Research Institute
KRTFAC	-	Kalinga Rice Terraces Farmers Agricultural Cooperative
LGU	-	Local Government Unit
MAO	-	Municipal Agricultural Office
MPHRFAC	-	Mountain Province Heirloom Rice Farmers Agricultural Cooperative
NIA	-	National Irrigation Administration
OPAG	-	Office of the Provincial Agriculturist
OTOP	-	One Town One Product
PAENRO	-	Provincial Agriculture, Environment and Natural Resources Office
PhilRice	-	Philippine Rice Research Institute
PRDP	-	Philippine Rural Development Project
PSA	-	Philippine Statistics Authority
RTFC	-	Rice Terraces Farmers Cooperative
RVCA	-	Rapid Value Chain Analysis
SCU	-	State Universities and Colleges
SHG	-	Self-help group
VCA	-	Value chain analysis

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EXECUTIVE SUMMARY

The heirloom rice varieties in the Codillera Administrative Region (CAR) maintained their uniqueness and purity for generations following traditional/organic ways of rice farming in the terraces. These rice varieties were popular in the global market before an increase in demand in the domestic market was realized. The rapid value chain in Phase I of the Heirloom Rice Project (HRP) highlighted the grains of heirloom rice varieties as they flow from producers and through different marketing channels until they reach the final consumers in the global and domestic markets. The expanded value chain analysis (VCA) in HRP Phase II included other processed products of heirloom rice such as rice wine, rice cookies, rice cakes, etc, and its by-products, particularly the broken grains. The processors of these products are small-scale entrepeneurs, often also involved in the production of heirloom rice, and many of whom had been in existence even before the HRP. Because of the focus on processed products and by-products, the VCA in Phase II does not reflect the presence of the global market that they have yet to penetrate.

Provincial cooperatives were formed during Phase 1 and 2, namely the Kalinga Rice Terraces Farmers Agricultural Cooperative (KRTFAC), the Mountain Province Heirloom Rice Farmers Agricultural Cooperative (MPHRFAC), the Ifugao Heirloom Rice Producers Cooperative (IHRPAC), and the Benguet Heirloom Rice Farmers Agricultural Cooperative (BHRFAC). During this stage of the HRP, the developments along the value chain have been in the consolidation of the unprocessed[1] or unpolished[1] heirloom rice by the cooperatives, where members as well as non-members utilize the cooperative's services. The cooperatives provided the channel for members to earn income and to ensure a regular market presence for heirloom rice through having enough supply for other distributors, processors, wholesalers, or retailers of heirloom rice.

Heirloom rice is known for its colored grains (red, violet/purple, brown, and off-white), flavorful aroma, delectable taste, and nutrional value, hence commanding a premium price of P100 to P150 per kilogram and generating a high demand by health-conscious consumers. Most heirloom rice varieties are grown over 6–7 months, enabling only a single cropping season per year, thus contributing to the low yield of these grains. There are several varieties of heirloom rice that exist in a province but not all of these are made available to the market. The heirloom rice farmers identified premium quality rices in their provinces, namely Chong-ak, Ulikan, and Chaykot in Kalinga; Ominio, Balatinao[2], Gilgilang, Chor-chor-os, Fiakrar, and Kotinaw in Mountain Province; Minaangan, Imbanig, Dolkitan, Madduli, and Botnol in Ifugao; and Balatinaw[1], Lasbakan, and Kabal in Benguet.

The heirloom rice farmers are the indigenous peoples of their provinces and most of them had been farming all their life. Their ages range from 47 to 65 years old and reflect the aging of Filipino farmers, a consequence of the decline in youth involvement in agriculture. Men and women participate in the terrace farming, where men do the heavy-loaded tasks such as clearing the field and fixing the terraces and canals, while the women do the time-consuming and repetitive tasks such as manual plowing, transplanting, and weeding. Men and women join together in harvesting but the postharvest activities (winnowing and handpounding) are mostly done by women.

The VCA surveys conducted under the HRP Phase I helped farmers gain insights into their production costs and profits, which caused them to adjust the farmgate price from P40–60/ kg to P90/kg. However, in the Phase II VCA, further evaluation of the pricing or costing of heirloom rice shows that there is an additional P90/kg price margin from the average farmgate price to the average retail price, particularly for a specific rice variety, Chong-ak, in Kalinga. This is a typical case in Kalinga which can imply that heirloom rice farmers may be able to command even higher prices. The cooperatives sell the unpolished rice where the unbroken grains are priced at P100–120/kg and the broken grains at half that price.

[1] The term unprocessed heirloom rice refers to heirloom rice with hull/husk and the unpolished heirloom rice refers to heirloom rice that has undergone manual or single pass milling, generally called the brown rice which only the hull is removed and the bran layer is still intact.

[2] There are heirloom rice varieties with the same pronunciation but different spelling; e.g., Balatinao is planted in Mountain Province while Balatinaw is planted in Benguet.

The participants for the focus group discussions (FGDs) who are members of the provincial cooperatives appreciated the improvements introduced by the HRP in their postharvest activities. The use of the solar bubble dryer (SBD) was the most common innovation cited. Farmers requested for a smaller size than the one initially demonstrated to fit on the rugged and narrow terrain of their farms. The cold and rainy weather conditions of the Cordilleras present challenges to the drying of palay either in bundle or threshed form. The use of the SBD dries the palay in one to three days regardless of the weather compared to a week or more with sundrying on pavements or trellises. Since one of the HRP's objectives is to link the heirloom rice farmers to the market, other postharvest innovations were introduced such as the length grader and vacuum packing machine, both of which improve the marketability of selected heirloom rice varieties. The length grader facilitates the selection of uniform grain sizes and the vacuum packing machine gives the grains a longer shelf-life.

The production of processed products from heirloom rice such as rice wine, cookies, and cakes lack standarization of the processing procedures and adherance to safety measures. Most of the processed products are done in small-scale and some are only available during specific local festivities. Linking these small-scale processors to established companies, e.g., Destilleria Limtuaco for rice wine, would be of great help to the heirloom rice wine processors in particular. The rice wines from heirloom rice are sold in stalls and shops within the Cordillera region but these are not popularly seen in supermarkets in the capital cities of the Philippines such as in the Cities of Manila or Makati. Improvements in quality and packaging are needed if the intention is to reach high-end markets.

The by-products of heirloom rice are rice straw, hull/husk, and rice bran, but among these three only the rice hull/husk has a market value at P10/kg. The rice straw is not marketed, but instead used as organic fertilizer and is instantly incorporated into the soil. The bran, which is the most nutritious part of the rice grain, is often discarded since only a very small amount is produced. The brewer, smaller in size than the broken grains, is given to chickens. The broken grains, which used to be unavailable in the market, are now sold at half the price of the unbroken grains. One of the promising uses of rice straw and/or rice husk/hull is in mushroom production used as mushroom bed or as material for mushroom spawn.

The VCA in HRP Phase II shows that the heirloom rice farmers are empowered through their cooperatives as stated in Republic Act (RA) No. 7607 known as Magna Carta of Small Farmers signed in 1992. Other laws formulated include the Presidential Decrees 260:1973 and 1505:1978 that declared the rice terraces as National Treasures; RA 10066:2010 for the protection and conservation of the National Cultural Heritage; RA 10068 or The Organic Agricultural Act of 2010; and RA 11203:2019 or The Rice Tariffication Law.

The VCAs of Phases I and II of the HRP provide essential information on the processes and pricing of heirloom rice varieties, ensuring sufficient valuation of every input, particularly that for the heirloom rice farmer's labor. The maximum value of heirloom rice varieties will, of course, be derived from the unbroken grains. However, there is a capacity to generate further income gains and to maximize the full potential of heirloom rice through the sales of its by-products, as evidenced by the emerging markets for broken grains and rice hull/husk. Further research and investment would be needed to fully exploit the heirloom rices' bran, which has nutrition and oil-generating potential, and explore and expand opportunities for processing heirloom rice into rice wines.

1. INTRODUCTION

The Cordillera Administrative Region (CAR) is unique with its rich cultural heritage, scenic landscape, magnificent rice terraces, and the diversity of its heirloom rice varieties. The way of life of its people revolves around the rice terraces from which substantial aspects of their traditions and livelihoods are derived. The region was designated as a UNESCO World Heritage Site in 1995. The heirloom rice varieties, which are grown in the terraces, are bequeathed as inheritance from one generation to another, with the transfers involving traditional rituals and cultural accoutrements like special jars.

Heirloom rice varieties have particular and favourable cooking qualities such as aroma, taste, texture, and color (red, violet/purple, brown, and off-white), and nutritional values[3]. Varietal product development through the characterization of existing heirloom rices was initiated in Phase I of the Heirloom Rice Project (HRP) where these varieties showed various levels of resistance to economically important diseases (bacterial blight, rice blast, and tungro) and tolerance to environmental stresses (drought)[1]. This characterization is detailed in the Varietal Catalogue 2020 (Cope et al 2020). Despite their popularity and significance, however, heirloom rice varieties or indigenous rice varieties are not considered as one of the major crops in CAR (Briones 2007; PSA 2018), but these are still high-value products due to the organic nature of farming practiced in the region (Briones 2007).

A recent study in 2018 (Cuevas et al 2018) revealed that the marketing strategy for heirloom rice as a way to preserve both the rice terraces and cultural heritage is an effective way for consumers to change their preferences from white rice to heirloom rice. However, increased demand for heirloom rice can only be generated if the product can be successfully integrated into Filipino diets. Based on projected suitability of heirloom rice in current eating occasions, dishes and ingredient pairings, experts estimated that heirloom rice can, at best, take over half of the market for regular rice in the Philippines (Cuevas et al 2017). The authors concluded that "In order to realize this potential, value chain actors will have to apply an optimal marketing mix to capture and promote traditional rice products' unique selling points and differentiate them from other products in the premium rice market (e.g., Jasmine, Japonica, brown rice, Basmati). The optimal marketing mix consists of the "four Ps": (i) a product with intrinsic (texture, aroma, taste, etc.) and extrinsic (branding, packaging) attributes tailored to consumer preferences; (ii) a pricing strategy based on positioning of traditional rice in the premium market and price elasticity considerations; (iii) a promotion strategy (e.g., advertising, social media marketing, video marketing, etc.) to disseminate relevant information to consumers about traditional rice and differentiate it from the other premium rice products (e.g., through its distinct cultural heritage); and (iv) the place where the product will be sold (e.g., in supermarkets, food fairs, fair-trade shops, domestic markets, international markets, etc.). Bairagi et al. (2021) subsequently interviewed 500 urban consumers from Metro Manila in July–August 2015. They found that consumers were willing to pay P72.61/kg (US$1.60/kg) for heirloom rice, which is less than half its current market price. The authors argue that "This explains why heirloom rice struggles to gain market share in urban markets in the Philippines. Given this bid price, we estimate a potential market size of PHP 20.3 billion (USD 443 million) that could be created for heirloom rice and tapped into by heritage farmers." For example, non-traditional rices are classified as well-milled rice and regular milled rice and are priced at P42.40/kg and P38.86/kg, respectively (PSA 2020), compared to unpolished Balatinao, a type of violet rice from Mountain Province, which is priced at P150/kg and packed with the seal of the province[1]. Bairagi et al. (2021) concluded that "Therefore, either demand for heirloom rice needs to be lifted by adding value to the product; or production costs need to be reduced through investments in enhancing productivity and value chain upgrading."

Rice is one of the important crops of the agricultural sector of the Philippines. However, the share of agriculture in the Philippines' gross domestic product has been declining and is now at 8.8 percent (PSA 2019). Its share in the labor force has also been halved from 46% (1993) to 23% (ILO 2020 estimate[4]). The total land area used for agricultural crop cultivation in the Philippines is around 13.50 million hectares, with about 34% planted to rice. Rice cultivation is done under irrigated, rainfed, and upland ecosystems, with majority (70%) in the irrigated

[3] Project Report HRP Phase I

[4] Philippines Employment in Agriculture: https://tradingeconomics.com/philippines/employment-in-agriculture-percent-of-total-employment-wb-data.html

ecosystem. Figures 1a and 1b show the regions of the country engaged in rice production as well as the proportion of area harvested to rice and the volume of production per region. CAR belongs to the five regions with lesser areas planted to rice, hence, the lower volume of rice produced here. The other four regions in this group are Region IV-A CALABARZON, Region Vll Central Visayas, Region lX Davao Region, and Region Xlll Caraga. The regions with larger areas planted to rice and with corresponding higher volumes of rice produced are Region l Ilocos, Region ll Cagayan Valley, Region lll Central Luzon, and Region Vl Western Visayas.

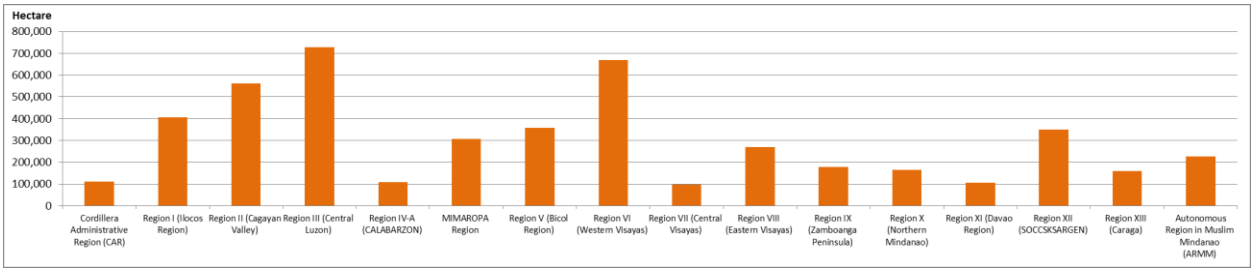


Figure 1a. Area harvested in hectare for rice by region, 2018 (PSA 2018)

The total rice production of CAR is only about 2% of the total rice production of the country (Table 1), with 2.5% produced in irrigated and 1.3% in rainfed conditions. Majority (77%) of the rice ecosystems in CAR are irrigated, where the elaborate irrigation system—an engineering marvel—was created using basic tools. Rice yield in tons/hectare is relatively very low in CAR and in both types of ecosystem.

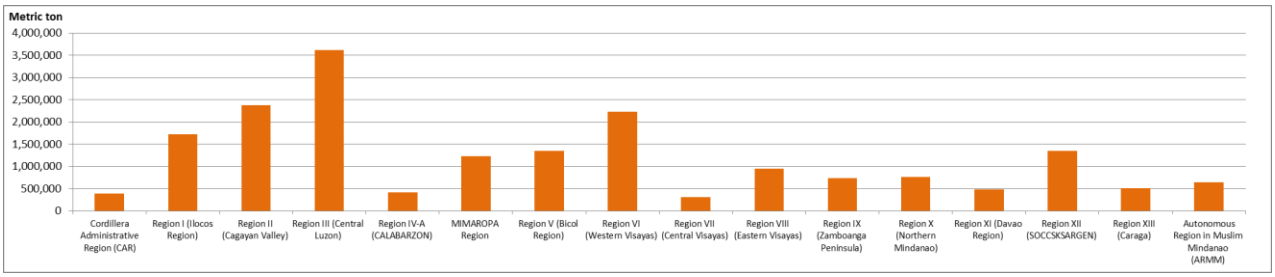


Figure 1b. Volume of rice production in metric tons by region, 2018 (PSA 2018)

Table 1. Philippines and CAR on volume of rice produced, area harvested, and yield, 2019.

Parameters	Total		Irrigated		Rainfed	
	Philippines	CAR	Philippines	CAR	Philippines	CAR
Volume of production in metric tons	18,814,827	418,321 (2.22%)	14,468,945	363,372 (2.51%)	4,345,883	54,948 (1.26%)
Area harvested in hectares	4,651,490	110,763 (2.38%)	3,262,486	90,312 (2.77%)	1,389,004	20,451 (1.47%)
Yield (tons/hectare)	4.04	3.78	4.43	4.02	3.13	2.69

Digits in parenthesis () are percent shares of CAR to the Philippines; Source: PSA updated data 17 Jan 2020.

Correspondingly, the Philippine Statistics Authority (PSA) (2020) provided data on the volume produced, area harvested, and yield in the irrigated and rainfed ecosystems (Appendix Table 1).

1.1. Trends in rice production in CAR

There is an increasing trend in the production of palay in CAR across all ecosystems (irrigated, upland, and rainfed), where modern varieties account for at least 60% of the total estimated production. There is also an increasing trend in area harvested for palay. From 64,570 hectares of area harvested in 1990, it has reached 111,387 hectares in 2018 (Table 2). It is also worth noting that there is an increase in the area harvested for modern varieties. In the

early 1990s, modern varieties[5] accounted for a little more than half of the area harvested, but this increased to at least 92% by 2018. In 2007, the lowest yield of traditional varieties[5] was recorded at 2.6 MT/ha. In recent years, however, yield of traditional varieties amounts to at least 4 MT/ha. Modern varieties almost doubled this figure to 7.6 MT/ha, with an average 3 MT/ha gap compared to traditional varieties. The heirloom rice varieties are included as traditional varieties in these tables.

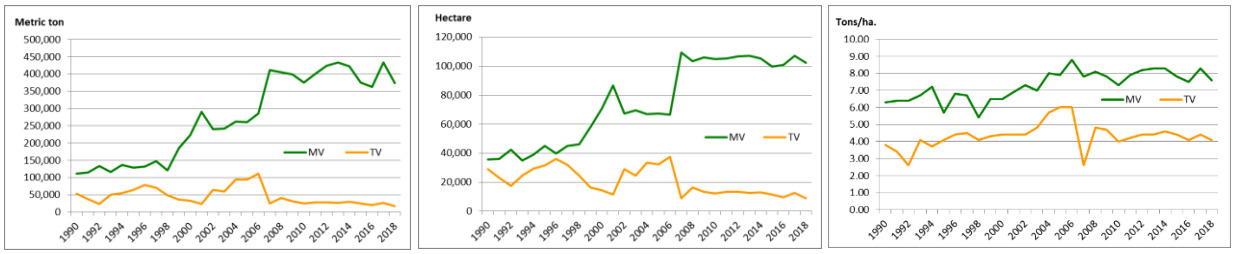
Table 2. Estimated production, area harvested, and yield per hectare, all ecosystems, CAR, 1990-2018.

Year	Production in metric ton (mt)		Area harvested in hectare (ha)		Yield per hectare (mt/ha)		
	Total	% Modern Variety	Total	% Modern Variety	Total	% Modern Variety	Traditional Variety
1990	165,585	67.4	64,570	55.1	5.1	6.3	3.8
1991	152,559	74.9	59,330	61.1	5.2	6.4	3.4
1992	156,472	84.9	59,990	70.8	5.3	6.4	2.6
1993	166,961	69.7	59,580	58.5	5.7	6.7	4.1
1994	191,208	71.6	68,230	57.0	5.7	7.2	3.7
1995	193,221	66.6	76,387	58.8	5.1	5.7	4.1
1996	209,480	62.7	75,609	52.5	5.7	6.8	4.4
1997	218,523	67.4	77,269	58.4	5.8	6.7	4.5
1998	169,968	71.2	71,029	65.2	4.9	5.4	4.1
1999	221,370	83.8	74,563	77.9	6.1	6.5	4.3
2000	255,820	87.4	85,084	83.1	6.2	6.5	4.4
2001	314,295	92.5	98,017	88.4	6.6	6.9	4.4
2002	304,355	79.0	96,231	70.0	6.4	7.3	4.4
2003	300,776	80.2	94,431	73.8	6.4	7.0	4.8
2004	355,877	73.7	100,171	66.7	7.3	8.0	5.7
2005	354,429	73.5	99,375	67.6	7.3	7.9	6.0
2006	397,340	72.0	104,021	63.9	7.8	8.8	6.0
2007	436,311	94.3	118,135	92.5	7.7	7.8	2.6
2008	445,156	90.9	119,816	86.3	7.7	8.1	4.8
2009	431,656	92.6	119,368	88.8	7.5	7.8	4.7
2010	400,415	93.6	117,057	89.6	7.0	7.3	4.0
2011	428,949	93.5	118,779	88.6	7.5	7.9	4.2
2012	453,461	93.6	120,100	88.8	7.8	8.2	4.4
2013	460,170	94.2	119,919	89.5	7.9	8.3	4.4
2014	452,609	93.5	118,476	88.9	7.9	8.3	4.6
2015	400,911	93.7	111,482	89.5	7.5	7.8	4.4
2016	382,848	94.7	110,640	91.2	7.2	7.5	4.1
2017	460,170	94.2	119,919	89.5	7.9	8.3	4.4
2018	391,105	95.4	111,387	91.9	7.3	7.6	4.1

Source: PhilRice PalayStat (https://dbmp.philrice.gov.ph/palaystat/)

Plotting the figures in the above table into a line graph (Figures 2a to 2c) shows that there is a huge gap between the modern and traditional varieties in terms of the volume produced and area harvested, through time. This implies that there is a potential for the production and area harvested of the traditional rice varieties to get closer to the levels of the modern varieties where such can be realized if the restored damaged rice terraces are planted with traditional varieties. The yield on the other hand, can increase further with improvements in rice production practices such as decreasing the age in days of the seedlings before transplanting, using of postharvest systems to lessen the damage and loss during drying and milling, and other strategies.

[5] Modern rice varieties, commonly know as high-yielding varieties, have higher yield potential, shorter growth duration, smaller plants, multiple resistance to diseases and insects and tolerance to problem soils, and better grain quality; while traditional rice varieties are exceptionally rich in genetic diversity and possess excellent traits including better grain quality profile, health and nutritional values, and resistance to climate-related stresses, pests, and diseases; traditional varieties have low yields, longer maturity growth, and taller plants.



2a. Volume produced 2b. Area harvested 2c. Yield

Figure 2. Volume of rice produced, area harvested, and yield, CAR, 1990-2018

The graph includes all the six provinces of CAR—Abra, Apayao, Benguet, Ifugao, Kalinga, and Mountain Province but only the last four provinces are covered by the HRP.

These four provinces were identified to have municipalities planting heirloom rice varieties (Project Report HRP Phase I), defined in this study as varieties that are solely grown in a specific site, e. g. province in CAR, and are passed down for generations. They are called as such to differentiate them from the term *traditional* rice varieties which encompass all other local varieties, including the heirloom rice varieties, with rich genetic makeup (IRRI 1983[6]; Sing et al 2000; Collard and Ismail 2013; Mbanjo et al 2019). The information on the area and number of farmers included in the HRP sites was provided by the project's local partners in the provinces through the DA-RFO CAR. The information came from the Offices of the Provincial Agriculturist (OPAG) for Benguet, Kalinga, and Mountain Province, and the Provincial Agriculture, Environment, and Natural Resources Office (PAENRO) for Ifugao.

Among the four provinces, Mountain Province has the largest area planted to heirloom rice varieties (7,082.07 hectares), followed by Ifugao (5,796.64 hectares) then Benguet (4,515.43 hectares), and the lowest is Kalinga (2,836.02 hectares) (Table 3). There are a total 45,165 farmers in Benguet, Ifugao, and Mountain Province, and the average farm area is less than a hectare, i.e., typically in the range of 0.31 to 0.47 hectares. Data for the number of farmers and average farm areas in Kalinga were not available at the time of the survey.

Table 3. Heirloom rice area, number of farmers, and average farm area, HRP sites, 2016.

Province	Heirloom rice area in hectare (%)	Number of farmers	Average farm area in hectares
Benguet (2018)[a]	4,515.43 (22)	10,084	0.45
Ifugao (2013)[b]	5,796.64 (29)	12,327	0.47
Kalinga (2018)[c]	2,836.02 (14)	-	-
Mountain Province (2010)[d]	7,082.07 (35)	22,754	0.31
Total	20,230.15 (100)	45,165	0.45

Sources: [a]Benguet OPAG; [b]PAENRO of Ifugao; [c]Kalinga OPAG; [d]OPAG Mountain Province

Table 4 lists the municipalities for each province and information about the area planted to heirloom rice and the number of farmers in each municipality. Mountain Province has the largest area devoted to heirloom rice (7,082 hectares), with the municipality of Natonin providing 22% followed by Bontoc, Sadanga, Tadian, and Barlig which have more than 10% of the rice area planted to heirloom rice. In 2010, the total number of heirloom rice farmers in Mountain Province was 22,754. For Benguet, of the 4,515 hectares planted to heirloom rice, the municipalities of Kapangan, Bakun, Kibungan, Bokod, and Tuba have the largest areas for heirloom rice production with about 500 hectares each. In Benguet, there are 10,084 heirloom rice farmers recorded in 2018. As of 2013, in the province of Ifugao, a total of 12,237 farmers grew heirloom rice on 5,797 hectares, with the municipalities of Mayoyao, Aguinaldo, Banaue, Kiangan, and Asipulo providing the bulk of this land. These municipalities also account for more than 80% of the total heirloom rice areas in the province. For Kalinga, the top three municipalities in terms of area are Tinglayan, Tanudan, and Pasil, which account for 63% of the total heirloom rice

[6] IRRI. 1983. Rice Germplasm Conservation Workshop, International Rice Research Institute. http://books.irri.org/9711041154_content.

area in the province.

Table 4. Heirloom rice area and number of farmers by municipality in CAR.

Province/Municipality	Heirloom rice area (ha)	% Area per municipality to total	Number of farmers	Average farm area
Benguet (2018)[a]				
Atok	233	5.20	885	0.26
Bakun	572	12.70	508	1.13
Bokod	543	12.00	851	0.64
Buguias	6	0.10	30	0.20
Itogon	325	7.20	1,288	0.25
Kabayan	169	3.80	433	0.39
Kapangan	730	16.20	2,920	0.25
Kibungan	571	12.70	1,127	0.51
La Trinidad	24	0.50	62	0.39
Mankayan	223	4.90	223	1.00
Sablan	375	8.30	623	0.60
Tuba	463	10.30	664	0.70
Tublay	280	6.20	470	0.60
Subtotal	**4,515**	**100.00**	**10,084**	**0.45**
Ifugao (2013)[b]				
Aguinaldo	1,165	20.10	2,185	0.53
Asipulo	677	11.70	1,661	0.41
Banaue	1,040	17.90	2,983	0.35
Hingyon	450	7.80	865	0.52
Hungduan	204	3.50	880	0.23
Kiangan	737	12.70	1,468	0.50
Mayoyao	1,286	22.20	1,793	0.72
Tinoc	239	4.10	492	0.49
Subtotal	**5,797**	**100.00**	**12,327**	**0.47**
Kalinga (2018)[c]				
Balbalan	356	12.60		
Lubuagan	373	13.20		
Pasil	475	16.70		
Punukpuk	320	11.30		
Tanudan	492	17.40		
Tinglayan	820	28.90		
Subtotal	**2,836**	**100.00**		
Mountain Province (2010)[d]				
Barlig	779	11.00	1,471	0.53
Bauko	683	9.60	2,821	0.24
Besao	550	7.80	1,295	0.42
Bontoc	939	13.30	4,745	0.20
Natonin	1,577	22.30	3,109	0.51
Sabangan	320	4.50	1,975	0.16
Sadanga	902	12.70	1,797	0.50
Sagada	449	6.30	1,518	0.30
Tadian	884	12.50	4,023	0.22
Subtotal	**7,082**	**100.00**	**22,754**	**0.31**
CAR	**20,230**		**45,165**	**0.45**

Sources: [a]Benguet OPAG; [b]PAENRO of Ifugao; [c]Kalinga OPAG; [d]OPAG Mountain Province

1.2. Background of the RVCA in Phase 1-HRP

The Rapid Value Chain Analysis (RVCA) in 2014 was done for nine days and was conducted by IRRI scientists and researchers in collaboration with partners from the DA-RFO CAR and state universities and colleges (SUCs) of the HRP—Benguet State University, Ifugao State University, Kalinga State College, and Mountain Province State

Polytechnic College. Data gathering was done using the following qualitative research methods: key informant interviews with different stakeholders; focus group discussions (FGDs) with groups of farmers and self-help groups (SHGs) members; and workshops on value chain analysis (VCA) with the stakeholders including the farmers and the SHG members. The VCA report for Phase I was an integration of the RVCA and the Philippine Rural Development Project (PRDP) VCA for pigmented rice (PRDP 2014). The PRDP provided the secondary data based on the initial analysis of aromatic and pigmented rices while the HRP Phase I RVCA provided insights from the field and from stakeholders for the heirloom rices in CAR (Project Report HRP Phase I 2016).

The Phase I VCA report generally focused on the production to marketing of paddy and milled whole grain heirloom rice. It revealed that appropriate valuation of labor costs would require an increase in the farmgate price of heirloom milled rice from P40–60/kg to P90/kg. The VCA found that heirloom rice production extensively used family labor and naturally grown fertilizers and insect and disease-repellant plants and organisms, hence a minimal to zero cash expense for labor and material inputs. The increase in the price was due to the imputed cost of family labor. There was no valuation of the material inputs and labor in producing these into fertilizers and/or pesticides.

The trade flows showed that middlemen traders had a considerable contribution in the distribution of heirloom rice; however, the increase in price had led them to shift their market strategy. At the same time, heirloom rice was becoming popular to Filipino consumers outside the region. There was an increase in local demand for heirloom rice from private/individual consumers, entrepreneurs, and institutions as Filipino consumer preferences have shifted to more nutritious and organically grown rice. Even before HRP Phase I, heirloom rice from CAR was marketed globally through direct farmer-to-consolidator transactions and small-scale exportation procedures. In addition, while the heirloom rice price was low, the volume of operations was also low. This process is no longer viable and the export markets are constrained by high volume requirements and high-quality standards (Bairagi et al 2021).

Local markets/buyers that patronize heirloom rice from CAR include the Mama Sita's Holding Company, Max's Restaurant, and Philippine Airlines, which are the more popular ones. Other companies or institutions include Holy Crop Enterprises, Berch Restaurant, The Sunny Side Café, Bigas PH, Discovery Suites Ortigas, and Jelly, and the Filipino Online Store[7]. An interview with the manager of the Rice Terraces Farmers Cooperative (RTFC), a regional cooperative, said that these companies had started to use heirloom rice in their products during the Phase I of the HRP and up to the current year. Pictures in Figure 3 from the internet show some of the products from heirloom rice and the company that retails/wholesales it. The webpages that contained these pictures were accessed only in March 2020 but since then the webpage of Bigas PH has undergone changes including the picture of their heirloom rice product.

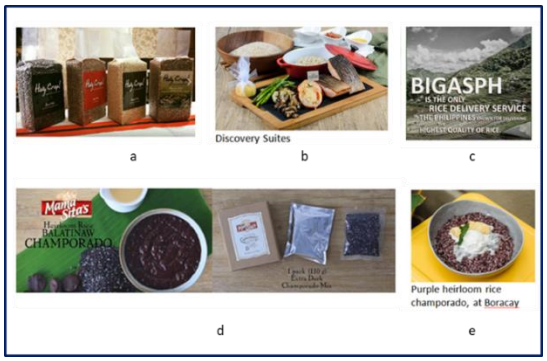


Figure 3. Images of heirloom rice marketed as unpolished grain and as a dish in restaurants[8]

The heirloom rice varieties were also introduced to international chefs who used these in local and international cuisines, leading to increased demand for heirloom rice in the cuisines of other cultures. The chefs and foreign consumers also have their own preference on how they want the heirloom rice to be processed for their specific

[7] The Filipino Online Store is a social entreprenuerial venture that showcases the excellent quality products of its partner farmers, fisherfolk, and cooperatives; promotes a healthy lifestyle; and advocates environmental sustainability. This is managed by Carol Lopez who is one of the patrionizers of heirloom rice varieties since HRP Phase I.

[8] Sources of the pictures: [a] https://www.facebook.com/holycrop.ph/photos/a.1054329437988217/1494599700627853; [b] https://www.clickthecity.com/food-drink/article/16230/discovery-suites-ortigas-22-prime-advocates-heirloom-rice-project/ [c] https://www.bigasph.com/; [d] https://mamasitas.com/product/mama-sitas-heirloom-rice-champorado-balatinaw/?site=global; [e] https://nolisoli.ph/53557/boracay-eats-abulan-20190104/

rice dish. For example, the Spanish and Italian chefs use dehulled rice in paellas and risottos (e.g., see Cuevas et al 2017), the American consumers prefer the semi-polished rice, while the Japanese choose sticky rice varieties like Bongkitan for their dishes.

2. OBJECTIVES AND METHODS

2.1. Objective

Bairagi et al (2021) recommended policy makers to focus on expanding domestic markets for heirloom rice into major urban consumption zones. This requires investments in productivity enhancement, value adding through value chain upgrading and demand lifting of heirloom rice through promotion campaigns. The Market Rapid Assessment in Phase II aimed to assess heirloom rice value chains in CAR with particular focus on their potential for value adding beyond rice grains as a product. The study primarily aimed at identifying the constraints and opportunities within the value chain to improve the production and marketability of heirloom rice and its products, both in the domestic and potential export markets.

The study generated insights on the constraints and opportunities for the heirloom rice segment. This further validated the information gathered in Phase I and elicited information on the value chain of processed products and by-products derived from heirloom rice. The emerging market opportunities and share of benefits from heirloom rice can be transferred to farmers by introducing value chain upgrading strategies which will help guide policy makers in prioritizing their investments to improve heirloom rice value chains.

2.2. Methods

The IRRI Ethics Committee provided clearance for the VCA research process and instruments to ensure that the research activities of the institute work in an atmosphere of accountability (Ray 2019). As part of the ethics review, participant information sheets (Annex 1) and informed consent forms (Annex 2) were prepared along with the documents for gathering information. The participant information sheet consisted of a brief overview of the project and confidentiality of the information gathered, while the informed consent form was signed as an agreement of the farmer-respondent's willingness and voluntary participation in a particular activity. Both the information sheet and consent form were translated to Ilocano, the lingua franca in CAR.

The study employed both qualitative and quantitative methods in collecting data from the various actors of the heirloom rice value chain in CAR—farmers, midstream actors (processors, wholesalers, traders, etc.), retailers and other stakeholders. For the quantitative method, the heirloom rice farmers were individually interviewed using a structured questionnaire. The qualitative methods used were focus group discussions (FGDs) among heirloom rice farmers, semi-structured interviews with the midstream actors and retailers, and key informant interviews with concerned staff from the local government units (LGUs) and other stakeholders. The target respondents and participants for data gathering were those who were involved in activities from the production, post-production, processing, and retailing of heirloom rice in its processed form and by-products.

Four activities were conducted for the VCA in the four HRP provinces in CAR. Each activity had a tool/instrument in gathering information from the respondents or participants. Table 5 provides a summary of the content of the instruments and criteria in the selection of respondents or participants. Exhaustive consultation and exchanges were done among the research teams composed of the offices of the Department of Agriculture—Regional Field Office (DA-RFO) of CAR, respective LGUs and village contacts, and IRRI.

Table 5. Overview of data collection instruments.

Tool	Content of the instrument	Criteria of respondents/participants
Activity 1. Focus group discussions	• Activities throughout the cropping season and management practices • Engagement in various operations in the rice enterprise	• Purposive sampling of male and female participants • 1 FGD with 8 to 12 participants who are members of HRP-assisted cooperatives

Tool	Content of the instrument	Criteria of respondents/participants
	• Challenges in rice production • Intrinsic and extrinsic attributes of heirloom rice varieties • Heirloom rice varieties grown, sold, and used for home consumption • Distribution/trade flow of heirloom rice varieties • Heirloom rice market trends, local and global	• 1 FGD with 8 to 12 participants who are non-members of HRP-assisted cooperatives • Minimum of 5 years as a farmer • Age should be between 25 and 55 • Actively participates in farmers' meetings, fora, etc.
Activity 2. Individual interviews with male/female farmers	• Rice production and disposal • Sellers and buyers of heirloom rice varieties • Cost and return analysis in rice production, labor, material, and equipment used • Rice consumption and other major expenses, aside from farming • Rice market trends, local and global	• Stratified random selection of male or female farmers • Random selection of 30 respondents from a complete list of members of HRP-assisted cooperatives • Random selection of 30 respondents from a complete list of non-members of HRP-assisted cooperatives
Activity 3. Individual interviews with midstream actors	• Rice operations performed • Processing methods (equipment) and finished products • Trading information • Intrinsic and extrinsic attributes of heirloom rice varieties • Varieties processed/ marketed/sold • Varieties preferred/prioritized • Customization (mixing varieties) • Trust and challenges	• Individual or farmers' group or agency/office who are also engaged in activities after rice production: o Consolidators o Traders o Processors o Wholesalers o Exporters
Activity 4. Individual interview with retailers	• Retailers' information • Purchase, storage, and delivery • Intrinsic and extrinsic quality attributes of heirloom rice varieties retailed • Customization (mixing varieties) • Trust and challenges	• Retailers within and outside of CAR • Individual or farmers' group or agency/office which is also engaged in retailing

Activity 1 consisted of the FGDs conducted with two groups of participants per province, one group including 8 to 12 participants who are members of HRP-assisted cooperatives, and another group of the same number who are non-members. Four HRP-assisted cooperatives were formed between 2016 and 2018 but not all began operation at the same time. The cooperatives which are currently functional are the Kalinga Rice Terraces Farmers Agriculture Cooperative (KRTFAC), Mountain Province Heirloom Rice Farmers Agricultural Cooperative (MPHRFAC), and Benguet Heirloom Rice Farmers Agriculture Cooperative (BHRFAC), while the Ifugao Heirloom Rice Producers Cooperative (IHRPC) was just starting to operate by mid-2019 when the VCA data collection was carried out. The FGDs were conducted in the respective provinces for the convenience of the participants. The facilitators and note takers were from the research teams.

Participants for the FGD were purposively chosen by the DA-RFO CAR partners and the LGU in each province using the following criteria: they must have at least five (5) years of experience as a rice farmer to be able to share production and processing activities in rice farming, should be within the age range of 25 to 55 years to cover varied and wide experiences in the rice enterprise, and should have an active participation in meetings and fora who can voice out their opinion in the group and in the presence of both men and women farmers.

Several adjustments and changes were done in the activity design for the FGDs. For instance, the age range of the participants was waived since younger generation farmers were scarce and the older ones beyond 55 years old were still active in farming. The number of participants per FGD was also relaxed because of availability concerns and the scheduling of the FGDs which coincided with other farmer activities to maximize their time. The total number of participants in the FGDs is 43 broken down as follows: 15 from Kalinga, 12 from Ifugao, 8 from Mountain Province, and 8 from Benguet (Appendix Table 2). The FGDs for non-members of the HRP-assisted cooperatives in Mountain Province and Benguet were not conducted due to unavailability of farmers.

For Activity 2, the individual interview with farmers was designed based on a selection of the sample respondents through stratified random sampling. A total of 30 farmers from a complete list of members of the HRP-assisted cooperatives and another 30 farmers from a complete list of non-members were supposed to be randomly selected. However, while the list of members was available per province, it was not complete for the whole province. Also, there was no available list of non-member farmers. Hence, farmer-participant selection for both cooperative members and non-members was based on their availability and willingness to participate.

The individual farmer interviews were conducted in only three provinces. As of December 2019, the total number of farmer-respondents was 77, of which 53 respondents were from Kalinga, 23 from Ifugao, and 1 from Mountain Province (Appendix Table 3). Individual interviews were not conducted in Benguet due to COVID 19-related restrictions.

Activities 3 and 4 involved key informant interviews with the midstream actors (consolidators, traders, processors, wholesalers, and exporters) and retailers, respectively. One to three representatives for the activities were interviewed in each province. Most of the key informants were pre-determined based on the collaborative activities in HRP Phase I and as identified by the DA-RFO CAR. The other key informants were identified during the conduct of the FGDs and individual interviews. Midstream actors interviewed were from Kalinga, Mountain Province, and Ifugao while the retailers were from Kalinga and Mountain Province (Appendix Table 4).

The four activities were well-organized in Kalinga and were completed in a week's time. The six members of the research team distributed themselves systematically for each activity; hence, all the farmers who were present in the meeting place were accommodated as respondents or participants. Also, the interview schedule for the midstream actors and retailers depended on their available time. This was not the same case during the conduct of the four activities in Mountain Province, Ifugao, and Benguet. A summary of the number of people met and interacted with during the four activities in each province is presented in Appendix Table 5.

Study Limitations:

The scheduling of trips to conduct the activities was highly dependent on the availability of partners from the DA-Agribusiness and Marketing Assistance Division (AMAD), LGUs and partners and in many instances, scheduled trips had to be postponed. There were also times when coordination with the local partners on the selection and number of respondents/participants for Activities 1 and 2 was inconsistent. Scheduling the FGDs and interviews with other joint field activities of DA-AMAD and IRRI facilitated data gathering but was challenging due to time constraints.

As suggested by the DA-RFO CAR and the LGU, the farmer-respondents went to a common place for the individual interview since most of their houses were far from the road and very far from each other. Through this strategy, the individual interviews in Kalinga were completed at once. In Ifugao, the farmers were interviewed after attending joint activities of the DA and the HRP. However, this strategy did not deliver the required number of respondents due to limited time since the farmers had to leave early to go back home. There was one non-coop member (from Mountain Province) who came for the FGD but the research team decided to include the farmer as a respondent for Activity 2. To complete the number of samples, the DA-RFO CAR team decided to conduct the individual interviews after their main field work. In Mountain Province, the DA-RFO CAR team interviewed the farmers but the participants' consent was not undertaken.

The discussions in the succeeding sections are based on the responses and information gathered from the four activities and from other stakeholders met during the data gathering. Previous and current research studies of the HRP are cited as relevant.

3. HEIRLOOM RICE VALUE CHAIN

This report focuses on value chains of heirloom rice products and by-products. This is understandably and inextricably linked with the value chain of heirloom rice itself. The entire heirloom rice value chain is also reviewed as part of this discussion in order to highlight changes since the VCA of HRP Phase I. One of the key trends, for example, has been the emergence of the provincial cooperatives as processors and consolidators.

3.1. The actors and supporters

3.1.1. Heirloom rice farmers

The farmers of the Cordillera region use their own rice seeds passed on to them over several generations which they plant on the terraces. Despite the push for the modernization of agriculture in the area, their cultural or traditional practices in rice farming remain the common methods used by the farmers. These heirloom rice farmers are the indigenous people of the locality whose way of life highly depends on their culture and environment.

Sociodemographic and economic characteristics of heirloom rice farmers were studied through FGDs and individual farmer interviews, with both methods gathering information about the farmers who were either members or non-members of the HRP-assisted cooperatives in their province.

The FGDs with the farmer-members of the HRP-assisted cooperatives were conducted in the four provinces with a total of 27 participants while the FGDs for the non-members were done in only two provinces, Kalinga and Ifugao, with a total of 16 participants. The six FGDs had a total of 43 heirloom rice farmers as participants. The individual interviews with members of the HRP-assisted cooperatives were conducted in Kalinga and Ifugao with a total of 46 respondents. For the non-members, a total of 31 individual interviews were conducted in Kalinga, Ifugao, and Mountain Province. The total number of respondents for all individual interviews was 77 heirloom rice farmers. The FGDs and individual interviews were conducted within the period of September 2 to December 3, 2019 in partnership with DA-RFO CAR.

The majority of the FGD participants (63% to 100%) and individual interview respondents (85% to 100%) from different sites and regardless of membership in cooperatives were women farmers. In fact, in the two FGDs in Kalinga and in the individual interviews for cooperative members in Ifugao and for non-members in Kalinga and Mountain Province, all the participants were women (Table 6). Previous studies have documented the participation of men and women in the agricultural sector in CAR, highlighting the participation of women. These studies mentioned that the women in Cordillera dominate the local economy (Rillo 2019) and contribute more than half of the labor requirements in rice farming (Tobias et al 2014) and in vegetable farming (Lu 2011). In general, women, can never be excluded or be made invisible in national agricultural and technology development plans and programs (Paris 1998). The Cordillera Highland Agricultural Resource Management Project has included men and women as beneficiaries in its Livelihood Assistance Fund (Capegsan 2014) and has recognized both men's and women's role in community enterprise activities (Manegdeg 2014). The high recognition of the CAR women has strengthened their self-confidence and conviction to attend meetings and participate in research activities in their area. Information from the FGD participants also showed that most of the participants were married; hence, most of the households had male and female heads.

The distribution of ages across sites and cooperative membership shows that the FGD participants and interview respondents fall within the middle-aged (36 to 55 years old) and older adulthood (56 years and older)[9] (Table 7).

[9] as classified by Petry (2002)

When based according to the stage when one works, the average age of the farmers belongs to the prime working age (25 to 54 years old) and mature working age (55 to 64 years old)[10]. In the FGDs, the younger (average, 43 years old) participants are from the non-members in Kalinga and the older (average, 56 years old) participants are from the cooperative members in Mountain Province. For the individual interviews, the younger (average, 41 years old) respondents are from the non-members in Kalinga, and the older (average, 59 years old) are from cooperative members in Ifugao and non-members in Mountain Province. The FGDs featured more middle age/prime working age respondents, while the individual interviews involved older adulthood/mature working age respondents. The aging of farmers is one of the concerns of CAR not because the farmers are getting old but because the younger generations are no longer attracted to rice farming, particularly in performing the physical production activities (Elias et al 2018; Luis et al 2018).

Table 6. Number and sex of FGD participants and individual interview respondents, CAR, 2019.

Item	Kalinga		Ifugao		Mountain Province		Benguet	
	MHRP[a]	NMHRP[b]	MHRP	NMHRP	MHRP	NMHRP	MHRP	NMHRP
FGD								
Number of participants	8	7	3	9	8		8	
Sex of participants (%)								
Male	-	-	33	22	38		12	
Female	100	100	67	78	63		88	
Individual interview								
Number of respondents	36	17	10	13	10	1		
Sex of respondents (%)								
Male	6	-	-	15				
Female	94	100	100	85		100		

[a]MHRP-Member of HRP-assisted coop; [b]NMHRP-Non-member of HRP-assisted coop; For shaded areas-activity not conducted

Table 7. Average age and education of FGD participants and individual interview respondents, CAR, 2019.

Item	Kalinga		Ifugao		Mountain Province		Benguet	
	MHRP[a]	NMHRP[b]	MHRP	NMHRP	MHRP	NMHRP	MHRP	NMHRP
FGD								
Number of participants	8	8	3	9	8		8	
Average age	48	43	52	47	56		54	
Educational attainment (%)								
Elementary	25	14	-	33	-		38	
High school	50	57	67	22	75		24	
College	25	29	33	44	25		38	
Individual interview								
Number of respondents	36	17	10	13	10	1		
Average age	52	41	59	58		59		
Educational attainment (%)								
Elementary	42	35	40	38				
High school	36	35	50	23				
Vocational	-	6	-	-				
College	19	24	10	31		100		
No response	3	-	-	8				
Average years in farming	32	23	40	35		33		

[a]MHRP-Member of HRP-assisted coop; [b]NMHRP-Non-member of HRP-assisted coop; For shaded areas-activity not conducted

The majority of the FGD participants reached high school level and about 1/5 have proceeded to college level. More than half of the members (50%) and non-members (57%) in Kalinga, and members in Ifugao (67%) and in Mountain Province (75%) were high school graduates. Groups with a relatively higher percentage of participants with college degrees are the non-coop members from Ifugao (44%) and the coop members in Benguet (38%). There is an almost equal proportion of elementary and high school graduates among the interview respondents.

[10] as defined in the Index Mundi (2019)

Those with higher proportions who completed elementary are the coop members from Kalinga (42%) and the non-members in Ifugao (38%), with higher proportions of high school completers among the Ifugao coop members (50%). It can be appreciated that the FGD and individual interview participants are highly literate. The average years in farming among the respondents ranged from 23 years (non-members from Kalinga) to 40 years (coop members from Ifugao), with these farmers belonging to the middle-older adults.

For the overall sample, the average age is 50 years old and the eduational attainment is distributed as 33% elementary, 40% high school, 26% college, and 2% had no experience in schooling.

The average household size varies from 3 members (respondents from Mountain Province) to 8 members (cooperative members from Ifugao) (Table 8). The range of the number of household members is from 2 to 14 members, with most of the households being larger than the average household size of 4 members in the Philippines (PSA 2015). The number of children ranges from 4 to 7, again larger than the nationwide average of 2.7 children (PSA 2015). This implies that with more members in a household/family, there will be more expenses on food which takes up about 40% of the total monthly expenses (POPCOM 2018) and other basic needs. Some participants have extended families with their married children still living in their family house who need to be supported by household resources.

Table 8. Average number of children and household size of FGD participants and individual interview respondents, CAR, 2019.

Item	Kalinga		Ifugao		Mountain Province		Benguet	
	MHRP[a]	NMHRP[b]	MHRP	NMHRP	MHRP	NMHRP	MHRP	NMHRP
FGD								
Number of participants	8	7	3	9	8		8	
Average number of children	4	4	7	4	7		6	
Average household size	6	5	8	6	7		7	
Marital status (%)								
Married	100	100	100	89	100		100	
Single	-	-	-	11	-			
Individual interview								
Number of respondents	36	17	10	13	10	1		
Average household size	6	5	7	6		3		

[a]MHRP-Member of HRP-assisted coop; [b]NMHRP-Non-member of HRP-assisted coop; For shaded areas-activity not conducted

Additional information on the primary and secondary occupations of FGD participants was gathered. The primary occupation for almost all participants is farming except for a participant in Ifugao (non-member) who works as an LGU employee and whose secondary occupation is farming (Table 9). There is a high proportion (63%) of participants from Mountain Province with secondary occupations as hired laborers. Only a few participants have non-farming secondary jobs such as being a utility man in a hospital (Ifugao non-member) and a church minister (Mountain Province coop member).

Table 9. Distribution of FGD participants by primary and secondary occupations, CAR 2019.

Item	Kalinga		Ifugao		Mountain Province		Benguet	
	MHRP[a]	NMHRP[b]	MHRP	NMHRP	MHRP	NMHRP	MHRP	NMHRP
Number of participants	8	7	3	9	8		8	
Primary occupation								
Farmer	100	100	100	78	100		100	
LGU employee	-	-	-	22	-		-	
Secondary occupation								
Hired labor	-	-	-	-	63		-	
Utility man in hospital	-	-	-	11	-		-	
Minister	-	-	-	-	13		-	
Housewife	-	-	-	-	13		-	
None	100	100		89	13			

[a]MHRP-Member of HRP-assisted coop; [b]NMHRP-Non-member of HRP-assisted coop; For shaded areas-activity not conducted

The respondents in the individual interview were further classified in terms of their use/disposal of the heirloom rice paddy harvested. Majority of non-members of the HRP-assisted cooperatives produce mostly for home consumption (76% in Kalinga, 54% in Ifugao) and sell only small portions of their produce (Table 10). Since the cooperative in Ifugao is newly established, the members have not started their sharing scheme for their produce. For KRTFAC, 80% of the members give their share to the cooperative. These are the members who give their share and produce for home consumption (58%) and the farmers who fulfil all three activities: producing for home consumption, selling a small portion, and giving their share to the cooperative (22%). Moreover, 20% of KRTFAC members do not contribute any portion of their produce to the cooperative; these are the 6% who produce only for home consumption and the 14% who produce for both home consumption and selling.

Table 10. Classification of respondents by usage of the harvest, individual interview respondents, CAR 2019.

Classification (%)	Kalinga		Ifugao		Mountain Province		Benguet	
	MHRP[a]	NMHRP[b]	MHRP	NMHRP	MHRP	NMHRP	MHRP	NMHRP
Number of respondents	36	17	10	13	10	1		
Produce only for home consumption (A)	6	76	80	54				
Sells small portion of produce (B)	-	-	-	-				
Gives portion to cooperative (C)	-	-	-	-				
Combination A & C	58	-	-	-				
Combination A & B	14	24	20	46		100		
Combination A, B, & C	22	-	-	-				

[a]MHRP-Member of HRP-assisted coop; [b]NMHRP-Non-member of HRP-assisted coop; For shaded areas-activity not conducted

The pictures below were taken during the FGDs in Lubuagan, Kalinga (Figure 4) and Lagawe, Ifugao (Figure 5) for members of the HRP-assisted cooperative KRTFAC and non-members of IHRPC, respectively. In Kalinga, the FGD was conducted at the porch of the village hall while in Ifugao it was conducted inside the building at the nursery compound. The FGD for members of the HRP-assisted cooperative MPHRFAC (Figure 6) was conducted in Ridgebrook Hotel in Bontoc, Mountain Province.

Figure 4. Focus group discussion with members of the KRTFAC conducted in Lubuagan, Kalinga on September 2, 2019

Figure 5. Focus group discussion with non-members of the IHRPC conducted in Lagawe, Ifugao on October 17, 2019

Figure 6. Focus group discussion with members of the MPHRFAC conducted in Bontoc, Mountain Province on October 15, 2019

Below are pictures during the individual interview (Figures 7 and 8) taken in Lubuagan, Kalinga.

Figure 7. Individual farmer interviews handled by staff of DA-RFO CAR and IRRI in Lubuagan, Kalinga on September 3, 2019

Figure 8. Group picture with some of the heirloom rice farmers interviewed individually at Lubuangan, Kalinga

While the older heirloom rice farmers had been in farming for several decades, the younger generations are more inclined to non-farming work such as being tourist guides or engaging in IT-related jobs. For both members and non-members of the cooperatives, the heirloom rice farmers keep most of their produce for home consumption. The portion of their produce that goes to the market is from the compulsory share given to the cooperative by the members or by individual selling of the grains directly to consumers.

Some concerns for the farmer-producers include the issue of aging farmers coupled with the youth's disinterest in farming, and the bulk of the produce being used for home consumption despite their high price in the market. Several government programs are addressing youth in agriculture concerns such as the creation of agri-entrepreneurialship programs. However, agricultural programs or benefits for the elderly who are still able to farm are not laid out.

The main tasks of the provincial cooperatives are consolidation and marketing, hence the members have to adhere to the programs of the cooperatives so that they can earn from their produce. Among these are training and technology access initiatives and improving the processing and marketing of heirloom rice, thereby also increasing the income of the heirloom rice farmers. Since farmers have several terrace plots, they can still retain some plots for the specific heirloom rice variety they use for home consumption.

3.1.2. Midstream actors

Equally important value chain actors are those in the midstream who perform various activities either on an individual capacity or as a group. The midstream actors are engaged in activities after rice production but before products are processed or reach the retailers and final consumers. Generally, these are the consolidators, traders, processors, wholesalers, and exporters. Each midstream actor performs activities that add value to the heirloom rice product but is not necesarily confined to do a single task. In heirloom rice production in CAR, some midstream

actors are also involved in the production stages aside from performing two or more tasks as midstream actors.

For the HRP, the interviewed midstream actors were the processors, consolidators, and wholesalers, working as individuals or through cooperatives, organizations, or self-help groups (SHG). Some of them were farmer/s and non-farmers who perform their tasks in the trading of heirloom rice products on a full-time or part-time basis.

Two of the midstream actors interviewed process heirloom rice into rice wine aside from being farm owners with hired laborers doing the farm activities. These are individual processors from Tabuk City, Kalinga (Figure 9) who also processes other heirloom rice products such as coffee, champorado mix, and cereal baby foods, and the processor from Asipulo, Ifugao (Figure 10) who processes heirloom rice wine only. The Kalinga processor was not quite open to share her procedures and ingredients in processing her products. The Ifugao heirloom wine processor, on the other hand, narrated with some detail the steps they follow in processing rice wine and the ingredients they use; his story is included as a case study below.

Figure 9. The farmer, processor, and retailer (2nd from right) from Tabuk City, Kalinga

Figure 10. Traditional processing of the heirloom variety Bongkitan into rice wine in Asipulo, Ifugao

The group midstream actors from Bauko, Mountain Province are the provincial cooperative (MPHRFAC) and the SHG—Blooming Hills. The MPHRFAC consolidates and processes the paddy into polished and unpolished heirloom rice, where the amount of paddy comes from the required/voluntary share of the members to the cooperative. Likewise, the SHG also consolidates paddy from the members and then processes (cleaning, unpolishing) these into whole grains and rice wine.

The regional cooperative in Banaue, Ifugao—Rice Terraces Farmers' Cooperative (RTFC)—which has been in existence since April 24, 2010 does the consolidation of heirloom rice paddy and grain, and processed products from the provinces of Ifugao, Mountain Province, and Kalinga. Currently the cooperative still maintains contacts and contributions from the four provinces despite the existence of the provincial cooperatives.

There are non-farmer-processors who purchase dehulled unbroken grain or broken grain heirloom rice from farmers who become their constant source and deliver the produce to their place. The processors contact these farmers through mobile text messaging and cash-on-delivery payment systems. The unbroken grain is processed as rice cakes, locally called *patupat*, in Bontoc, Mountain Province (Figure 11). The story on *patupat* making is also included in the section on the processing of heirloom rice. Rice grains are processed into rice flour and cooked as *nilapit/linapet* in Besao, Mountain Province (Figure 12). The processing of *patupat* is a full-time job and is the main source of income of one individual processor. The cooking of *nilapit/linapet*, on the other hand, is done by some individuals and organizations like the Ubaya Food Processors Organization which started in 2009—on a part-time basis and only done during municipal festivities and special occasions.

Figure 11. Processors/sellers of rice cakes along the streets of Bontoc, Mountain Province

Figure 12. Members of the organization which processes and retails rice cakes using ground rice flour in Besao, Mountain Province

Another processor is a full time-time employee and works part-time supervising family members in the processing of heirloom rice products. Processing is done in their residence in Lagawe, Ifugao and the products they make are rice cookies/bites, rice crunch, choco chips, and chocovron (Figure 13).

Figure 13. Heirloom rice products of a processor in Lagawe, Ifugao

Processed heirloom rice products vary from unpolished rice grains to processed foods. Most of the processors mentioned that the quantities of the products they produce are usually for small-scale businesses or are available only during festivities. Table 11 shows the classification of the processors interviewed with their respective processed heirloom rice product and province.

Table 11. Midstream actors and processed products with prices by province.

Province*	Midstream actors	Processed products from heirloom rice
Kalinga	1. Individual processor/retailer-farmer	• Rice coffee (P150 - P200/pack) • Champorado mix (P130–P150/pack) • Foods for baby (new product) • Rice vinegar (P100–P130/bottle) • Chili paste - powdered Unoy with chili (P22)
Mountain Province	2. Individual processor-seller	• *Patupat* (P60 per pack of 10 pcs)
	3. Organization processor	• Rice flour (used for processing products) • *Nilapit/linapet* (P10/pc)
	4. SHG- consolidator/processor/seller-farmers	• Rice wine (P120–P150/bottle • Polished heirloom rice in vacuum sealed pack (P110/kg) • Unpolished heirloom rice (P60–P70/kg)
	5. Provincial cooperative-consolidator/processor/ wholesaler/retailer-farmer	• Polished heirloom rice vacuum sealed DA design pack (P120/kg) • Unpolished heirloom rice (P90/kg)
Ifugao	6. Individual processor/retailer-farmer	• Rice wine (P120/bottle)
	7. Individual processor-wholesaler/retailer	• Rice cookies/bites (wholesale: P42/pack at 200 gm per pack; retail: (P55–P65/pack) • Rice crunch (same as the cookies) • Choco chips (same as the cookes) • Chocovron (same as the cookies)
	8. Regional cooperative-consolidator/processor/ wholesaler/retailer	• Polished heirloom rice (P130–P140/kg) • Unpolished heirloom rice (P80–P90/kg) • Outlet of other processed goods

* Interviews with midstream actors in Benguet were cancelled due to the COVID19 restrictions
** Prices of processed products are in parethesis; a bottle of wine is 100ml

There is a potential to link these processors to the market through appropriate guidance and assistance from relevant government agencies/offices or business enterprises. As small-scale processors, they are usually beset by issues of reliability of supply of raw materials, standardization of their products for quality and consistency, adherence to safety and regulatory procedures, and limited networks to connect with established or commercial-scale markets.

3.1.3. Retailers

The retailers are at the end of the value chain and these are persons or businesses that sell goods to the final consumers (public) in relatively small quantities for use or consumption rather than for resale. Face-to-face interviews with retailers based in Tabuk City, Kalinga and Sagada, Mountain Province were conducted, depicting the two types of markets—the modern market and the traditional market—of heirloom rice grains and other processed rice products (Table 12).

Table 12. Retailers' type of market and place of operation by province.

Province	Type of market	Place of operation
Kalinga	Modern market	OTOP San Juan, Tabuk City, Kalinga
Mountain Province	Traditional market	Sagada Public Market

Note: Interview with retailers from Ifugao and Benguet were not conducted

The modern market in Kalinga is the One Town One Product or OTOP store which is located in a hotel and restaurant building (Figure 14a). The OTOP shop displays a variety of products and is open everyday. It sells whole grain heirloom rice and processed products as well non-rice products and non-food products from Kalinga. The owner also works in rice production and is also engaged in processing and packaging unbroken grain heirloom rice.

For the traditional market (Figure 14b), heirloom rice grains and rice wine bottles are displayed on the shelves. Retailers in the market usually rent the space where they sell their products and they get a permit from the municipal hall which states the kinds of products they are allowed to sell. They are permitted to sell produce from their province such as beans and rice grains only during the weekdays, but on weekends, they are allowed to sell other products that come from other provinces such as rice wine and salted eggs. Most often the bulk of local and international tourists visit the markets on weekends, which gives an opportunity for the retailers to earn additional income.

Modern market (a)

Traditional market (b)

Figure 14. Retailers of heirloom rice by type of market

The retailers interviewed are also engaged in farming heirloom rice. The OTOP owner started with rice production and expanded her business to include the hotel and restaurant. The restaurant serves specialty products such as brewed coffee, also organically produced in the town. The retailer from the traditional market is married to a farmer from the adjacent province, hence, aside from selling heirloom rice varieties from Mountain Province she is able to sell other varieties sold only during weekends, too.

These retailers did not mention the provincial cooperatives, MPHRFAC or KRTFAC, as their source of heirloom rice grains but they buy from individuals or groups of farmers who have been their contacts for several years. To assess the volume of heirloom rice that pass through the different channels of the value chain, the DA-RFO CAR, particularly AMAD, can develop a monitoring scheme to follow the flow of heirloom rice from production to retail.

3.2. Value chain in CAR

3.2.1. Value chain of the heirloom rice in CAR

The concept of the value chain was popularized by Porter in his 1985 best-seller book *Competitive Advantage: Creating and Sustaining Superior Performance.* The value chain is defined as consisting of a "full range of activities, which are required to bring a product or service from conception, through the different phases of production, distribution to consumers, and final disposal after use" as quoted by Zamora (2016), and with modifications on the production phase to include a combination of physical transformation and the input of various producer services as mentioned in Kaplinsky and Morris (2000) and in Hellin and Meijer (2006) in their handbook or guide for value chain analysis. Along the chain, the product passes through several links where it gains some value after every activity or a series of activities. The chain of activities gives the product more added value than the sum of added values of all activities.

The value chain of heirloom rice shows the different actors in the chain and their specific functions in adding value to the product (Figure 15). The actors along the value chain starts with the farmers, then traders, processors, wholesalers, and retailers until the product reaches the consumers. The interactions and linkages among the actors in the chain are facilitated and supported by enablers from the government, non-government offices, farmer-cooperatives, self-help groups, and other private individuals or groups.

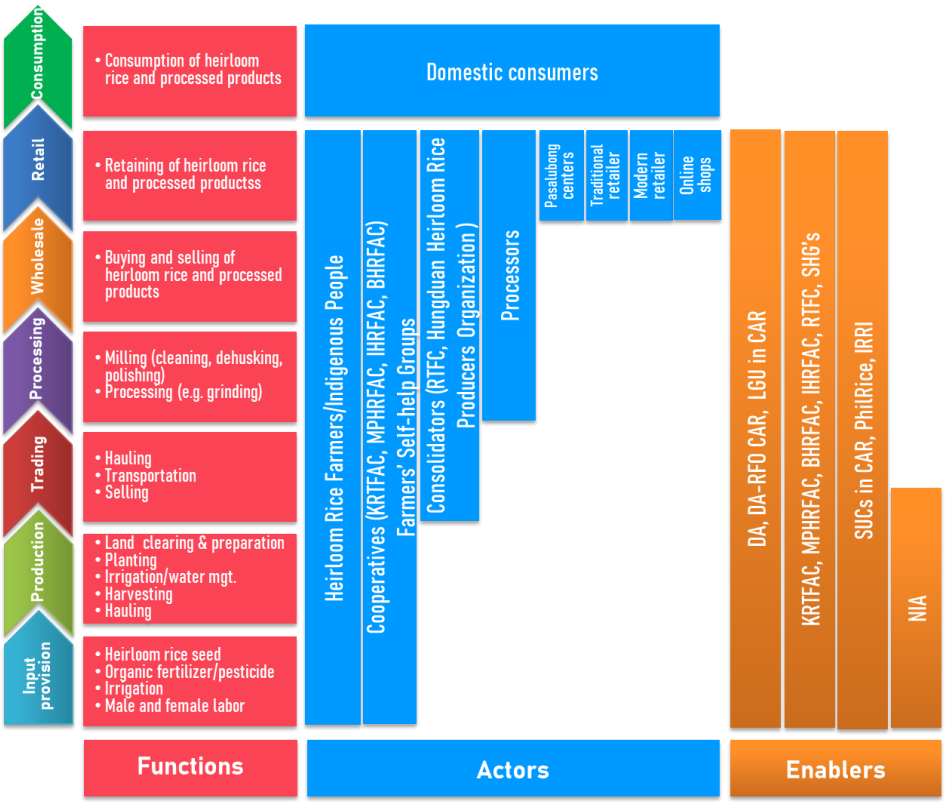


Figure 15. Value chain of the heirloom rice industry in the Cordillera Administrative Region.

Several models of vertical integration can be observed. Cooperatives, Farmers' Self-help Groups and some individual farmers are involved in the production, trading, processing, wholesale and even retail of heirloom rice. Others provide heirloom rice paddy to processors who process the rice and sell the final products to different types of retailers. These retailers could be Pasalubong Centers, traditional retailers, modern retailers, and on-line shops. The wholesalers/consolidators are the provincial cooperatives of the farmers, namely MPHRFAC, KRTFAC, BHRFAC, and IHRPC, as well as the regional cooperative (RTFC) and self-help groups.

Enablers are the people and institutions who build and manage relationships within the value chain. These include the cooperatives and farmers' groups along with the local governments, DA, PhilRice and IRRI. The National Irrigation Administration is also an essential enabler at the input component, particularly in the provision of reliable sources of irrigation water. The enablers in Phase II are similar to those in the value chain in Phase I of the HRP (Annex 4).

3.2.2. Heirloom rice paddy and by-products

Along the value chain map, the paddy moves down into several channels as polished or unpolished rice grain and as processed products sold at wholesale and retail levels. But aside from the rice grain, the paddy has by-products which are produced after certain activities such as rice straw, rice hull/husk, and rice bran (IRRI Knowledge Bank) (Figure 16).

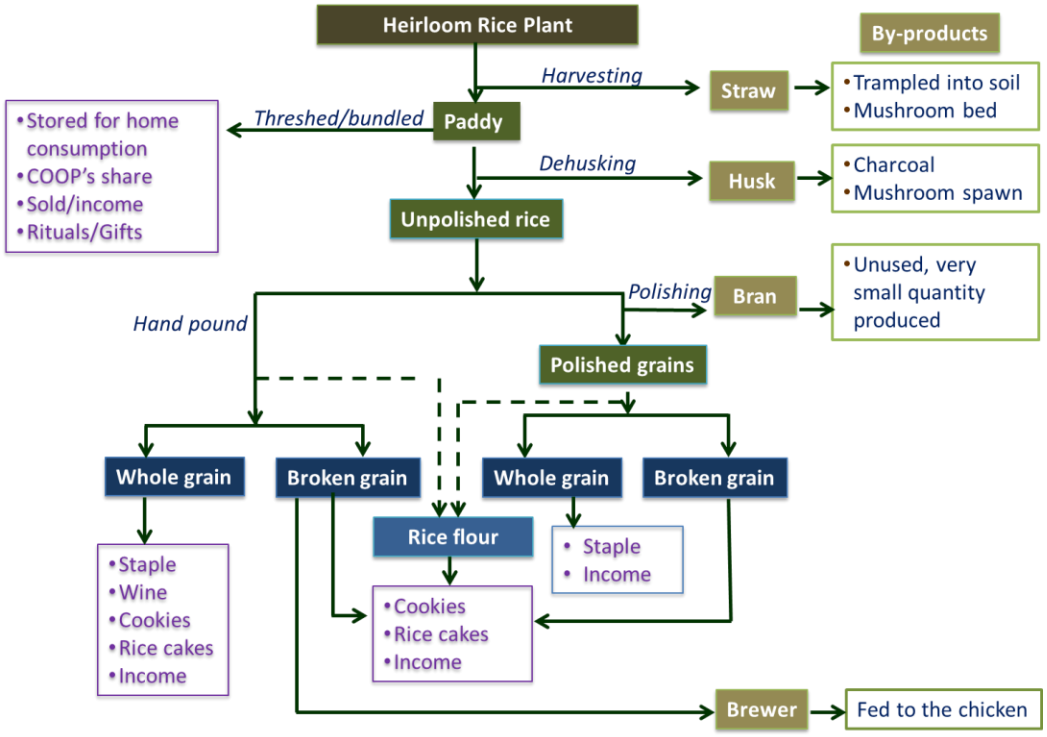


Figure 16. Heirloom rice processes, uses, and by-products in the Cordillera Administrative Region.[11]

After harvesting, the rice straw is left on the field which would either be gathered for livestock forages or burned to efficiently clear the field. In CAR, rice straw is left on the field to rot and is trampled into the soil during the land clearing/cleaning stage. It is also being used as mushroom beds and this has generated decent incomes from

[11] Reference: http://www.knowledgebank.irri.org/step-by-step-prduction/postharvest/rice-by-products#rice-husk

farmers in Vietnam (Thuc et al 2020). Threshed paddies are dehusked, the hull/husk is removed from the rice grain. Some members of the MPHRFAC started this year to venture into mushroom production by using the rice husk/hull as one of the components of the medium for the mushroom spawn. The MPHRFAC members are also converting hull/husk into carbonized rice hull which is mixed with the soil during seedbed preparation to make the soil softer which helps during pulling the seedlings. Presently, the price of carbonized rice hull is P10/sack of 10 kilos.

The rice bran, the most nutrient-dense part of the rice plant, is produced after polishing and this is not used in CAR mainly because only a small quantity is produced. Rice bran has an untapped market potential in the country. It is commercially used in Thailand, India, Indonesia, China, and Korea to produce rice bran oil for cooking and, more recently, for cosmetics. Rice bran oil is currently imported and is only available in a few supermarkets in the Philippines.

Another rice by-product is the brewer—this refers to small pieces of broken rice that remain after the milling process is complete. The brewer contains a considerable portion of the bran and some parts of the hull. In CAR, this is fed to chickens but, as illustrated in the figure, it could have higher value when utilized for other products for human consumption.

By-products with bigger sizes than the brewer are the broken grains which are usually a mixture of different rice varieties because they are not segregated during the milling process. These are used for home consumption and for processing heirloom rice products. In the last five years, these broken grains have been bought by processors of rice cookies/bites and rice flour at P30/kilogram. After 2016, farmers and other consumers began to buy broken grains in the market for home consumption because of its lower price.[12] The demand for broken grains for this purpose affected its supply for the production of rice cookies. To meet the amount needed to make cookies, one processor resorted to buying the unbroken grain, which then decreased her profit margins.

There is a potential for the products and by-products of heirloom rice to be marketed commercially, with the support of DA-RFO CAR and assistance from private businesses. These products and by-products are produced through different activities entailing labor costs, which can be compensated with appropriate pricing and marketing of the products. Table 13 summarizes the uses of the by-products and prices of the by-products that are are marketed.

Table 13. Prices of heirloom rice by-product.

By products	Uses	Prices
Rice straw	Organic fertilizer and mushroom bed	
Rice husk/hull	Carbonized rice hulled mixed into the soil at seedling prepraration	P10/kg P12/kg
Rice bran	Not collected due to small quantity produced	
Broken grains	Processed as rice cake and rice flour	P30 - P40/kg
Brewer	Fed to chickens	

3.2.3. Heirloom rice processed products

The processing of heirloom rice products and by-products in CAR often involves small-scale business enterprises. Following are three stories of processors of heirloom rice products. The first two had been engaged in the business for more than 20 years, while the third is just starting with the production of non-traditional products like rice cookies/crunch. The processors interviewed were also presented with the consent to participate as respondent in the research, in which they agreed as signified by their signing of the participant's information. Third party narration was used to conceal their individual identities.

Case 1: *Patupat* processing

[12] This information was gathered from the processor of rice cookies/crunches

A very diligent business woman, now at 58 years old, was proud to claim that the income she earned in selling *patupat* (Figure 17) sustained the educational expenses of her children. She herself has a bachelor's degree but when she married at an early age, she devoted her time to taking care of their children and the household. She started her business in 1987 (32 years ago) when she was only 26 years old.

Every day since she started, she sells *patupat* along the main highway of Bontoc town proper where she is joined by three other *patupat* sellers, all seated side-by-side along the corner of the sidewalk. All of them claim that they share the same recipe and the same heirloom rice variety in cooking *patupat*. She wholeheartedly shared her ingredients (including amounts and costs) and procedure in cooking *patupat*. She uses 10 kilograms of the Waray variety which she orders weekly from her female contacts in Kalinga and Mountain Province, the same women who approached her about 10 years ago and asked her to buy rice from them. She uses this variety because consumers prefer white rice over red rice, the latter being the more traditional *patupat* base. The unpolished rice is delivered to her in Bontoc. She gains P800 in processing and selling *patupat*. The following is the list of ingredients and cooking procedures she uses:

Figure 17. Processed heirloom rice cake "*patupat*"

Ingredients and costs per daily batch:

1. 12 pcs grated coconut (@P20/nut)	P240.00
2. 3 kg brown sugar (@P40/kg)	P120.00
3. 10 tbsp salt (@P0.75/tbsp.)	P7.50
4. 4 ganta glutinous heirloom rice (1 ganta=2.5kg @P200/ganta; 10kg)	P800.00
5. 100 pcs banana leaves (@P15/100 leaves)	P15.00

Procedure:

1. Soak glutinous rice for 20 minutes then drain the water. Set aside.
2. Extract the coconut milk from the grated mature coconut and place in a wok and let it boil for 30 minutes. Set aside the extracted coconut milk.
3. Add brown sugar into the wok and continuously mix until sugar is melted.
4. Add salt to the mixture.
5. Add soaked glutinous rice and mix well for 30 minutes until it blends with the other ingredients.
6. Remove from fire and let the mixture cool a little bit.
7. In the prepared and pre-cut banana leaves*, place about 1.5 tbsp of the mixture and wrap to form a triangular shape.

   *Preparation of the banana leaves: Pass the banana leaves on fire and apply on the surface the desiccated coconut (after extracting the coconut milk) for oily appearance. Cut on desired size enough to hold about 1.5 tbsp of the mixture.
8. Place triangular shape in a wok, add water up to the top of the triangular shape (depth of water), and cook for 4 hours
9. Open wok to cool down then transfer triangles in a wide native woven basket.

The cost and return analysis of processing *patupat* using 4 gantas or 10 kg of heirloom rice is shown in Table 14. The net profit is at P2,118.88 but this still does not account for the labor of Nana Leah as the supervisor and seller.

Table 14. Cost and return in processing *patupat*, Bontoc, Mountain Province.

Items	Value
A. Total cost of ingredients/materials	P1,182.50
B. Total cost for labor (2 female cook) and fuel (P500/tank)	P722.62
C. Total cost (A + B)	P1,905.12
D. Gross sales	P4,020.00
E. Net profit (D – C)	P2,118.88

Note: Quantity of processed *patupat* using 10 kg whole heirloom rice grains: The quantity in kilogram was converted to

tablespoon using the conversion 1 tbsp = 15 g

- Total tablespoons of mixtures 666.67 tbsp
- Tablespoon of mixture per triangle 1.50 tbsp
- Number of packs of 10 triangles 67 packs
- Price of 10 triangles per pack P60

She narrated that preparation takes 4 hours and cooking time is another 4 hours, for a total of 8 hours. At 6:00 am, she starts selling which would last for 2 to 3 hours. Daily buyers are locals from Bontoc, with occasional or weekend buyers from Manila and other provinces as well as visitors/tourists. Sometimes orders are placed by *balikbayans* or those coming from abroad at least three times a year with 100 pieces for every order.

All *patupat* vendors are able to sell their rice cakes daily, indicating a regular demand. While the shelf life at room temperature of these products is short, freezing and the use of better packaging could extend it, which is the case when orders from abroad are fulfilled. Variants using different kinds of pigmented rice are possible, and will appeal to consumers' demand for variety. The product has potential as it could be a source of value-added revenue for producers of heirloom rice products.

Case 2: Rice wine processing

A wine-processor was a farmer since he was 20 years old and spent 40 years as a worker in their own rice field along with other exchange laborers. He is now 82 years old and still very energetic, and for almost two decades he had only been supervising their farm and the processing of rice wine. Currently, the eldest daughter does the processing of the rice wine which was passed to her by her mother in 2014. It is a practice in their place that the first child or the eldest child is trained to process rice wine so that he/she can continue the task when the elderly cannot do so anymore.

Homemade yeast is one of the main ingredients in wine processing but the wine processor did not divulge how he makes the yeast he is using, since it is a top secret. He only shared the mixture used in processing the homemade yeast. The local term for the yeast is *binokbok* (Figure 18) in their place or more commonly known as *budbod* in other provinces of CAR. The yeast is composed of a mixture of grasses from the leaves, soft stems, and the roots known as *onyad*. The grasses grow widely but the rice wine makers have to plant them within their backyard. The mixture also includes leaves of native chili called *labuyo*. To make the *budbod,* the powdered rice is mixed with the grass mixture (which has a strong acidic juice). These are rounded to 1.5 inch in diameter and dried under the sun for at least three days; the dried yeast biscuits can then last from one to two months.

Figure 18. Homemade yeast

Ingredients used in processing rice wine:

1. 25 kg Bongkitan
2. 4 pcs of homemade *budbod*/yeast (round and dried)
3. Sugar to taste
4. Water to cover the rice grains

Procedure:

1. Boil half a big kettle of water then pour the whole grain rice in.
2. Cover the big kettle for 30 minutes.
3. Remove from fire so rice would not be overcooked.
4. Transfer to a big winnowing mat to cool off for 30 minutes. Ground the 4 pieces of *budbod.*
5. Spread evenly the powdered *budbod* and sugar into the cooked rice.
6. Place mixture into a drum, half-filled to have room to expand due to fermentation.
7. Wait for 15 to 20 days for fermentation.

From a 25-kg unpolished Bongkitan batch, 50 bottles of 700 ml/bottle rice wine can be produced. Each bottle is sold at P120, hence a profit of P3,350 can be obtained when considering only the cash costs. Not included in the cost is the labor used from cooking the rice up to transferring the mixture to the drum for fermentation. Costs and returns in processing rice wine are shown in Table 15.

Table 15. Cost and return in processing rice wine, Asipulo, Ifugao.

Items	Qty/Amount per unit	Price per unit	Total (P)
Materials			
Rice, Bongkitan variety	25 kg	P70/kg	1,750.00
Sugar	10 kg	P40/kg	400.00
Bottles (700ml)	30 bottles	P10/bottle	300.00
Washer boy	1 day	P300/day	300.00
Fuel wood	1 bundle, 5 big pieces	P100/bundle	100.00
Total cost			2,850.00
Gross sale	30 bottles	P120/bottle	3,600.00
Net income (less cash cost)			750.00

Cleaning, cooking, cooling, and transferring the mixture to a drum takes almost 6 hours and these activities can be done by one person. The eldest daughter does these activities which are not accounted for in the total costs; only the material cost is valued and not the labor cost. Figure 19 shows some of the procedures in processing rice wine in Asipulo: a. sundrying the homemade yeast; b. cleaning the bottles by soaking to easily remove the stains and smell of the bottles, then sundrying later; c. boiling the rice, and d. placing the cooked rice in a bamboo mat for cooling.

a b c d

Figure 19. Some procedures in processing rice wine

Case 3: Cookies/crunch and chocovron products

An enterprising local government employee from Ifugao, who is 56-year-old, and has a Master's degree units in Home Technology, ventured into processing heirloom rice into cookies and chocovron starting in 2016. She involved her eldest daughter in the business and they both process their products in their residence in a nearby village from the towncenter in Ifugao. They have also installed a store in front of their residence.

Broken heirloom rice grains are used in processing rice cookies. Before, these broken grains were not sold or bought by anybody but were only fed to native chickens but now, these are sold at P30/kilogram. The enterprenuer narrated that she used to have enough supply of broken grains when she started processing rice cookies; but since there was already a market for broken grains for home consumption, her supply decreased. Broken grains are usually mixed varieties which she buys directly from farmers in Ifugao.

She shifted and tried to use unbroken heirloom rice grain to make cookies. She bought and used the Minaangan variety from Hungduan sold at P100/kilogram through her contact who is an LGU worker there. She was introduced to farmers there who sent her text messages if there are available stocks of Minaangan. There is no contract between her and the farmers but she only buys yearly from those who have stocks of the variety. She fully trusts the farmer-producers, and even if she buys from their cooperative, she is confident that these are good quality heirloom rice grains.

After only a year into processing rice cookies, she was able to grow her business and establish several outlets for their products: in the OTOP shop in Kiangan (through consignment), in the Lagawe pasalubong center, in different tourist shops in Banaue (View Point Village, Green Valley, and Cherries View Point), at the JM Restaurant Payawan, and at the Department of Trade and Industry (DTI) hub in Baguio City. The products are picked up in the store by nearby retailers (e.g., Lagawe and Banaue) or sent by bus to Kiangan and Baguio City, most often through cash-on-delivery arrangements. She keeps a logbook with the list of wholesalers/ customers and she gives free gifts to her regular buyers.

Peak production months are between September and January during which cookies and chocovron are processed every day. During the lean months from February to August, processing takes 4 to 6 days a week or an average of 3 days a week. Since the start, even at the experimental stage, she has kept a record of their volume of production processed in a logbook. She gets feedbacks on the taste and quality of the products which she uses in testing different combinations of heirloom rice flour and wheat flour to get the most appropriate texture and firmness. With more rice flour, the texture is coarser especially on the throat. Through this, she found that the best ratio is a 40/60 rice-wheat flour combination. She experimented to find out what taste consumers prefer. For example, in Baguio City, she conducted a taste test on the cookies flavored with ginger, for which the majority of consumers commented that the ginger cookies lack the taste of ginger. There are three flavors of the crunch/cookies—ginger, turmeric, and *malunggay*—packed in 200 grams resealable packaging; and chocovron packed in a rectangular-shaped box (Figure 20).

Figure 20. Processed heirloom rice cookies, crunch, bites, and chips, sold in front of the processor's house

The main ingredients for the malunggay crunch are heirloom rice flour and wheat flour, the other ingredients are powdered malunggay, skim milk, sugar, margarine and eggs. Most of the ingredients were bought from the local market, the powdered *malunggay* was processed at home, and the mixed broken heirloom rice grains bought from the farmers were processed as flour in the market. The gross sales and the net income were not computed since the processor requested for confidentiality of the recipe, which she has worked hard to perfect the appropriate proportions and mixture, though she gave a general procedure for her products. The *malunggay* crunch packed at 200 grams has a wholesale price of P42/pack and can be retailed at P55 to P65 per pack.

Malunggay crunch procedure:

1. Mix all dry ingredients in a mixing bowl.
2. Add the margarine and egg into the mixture.
3. Place mixture in cookie pan.
4. Bake for less than an hour, cool down, and pack in resealable packing material.

For the chocovron, which was first processed in 2017, the ingredients include the heirloom rice flour, chocolate coatings, skim milk and sugar. A 5-kg rice flour produces 100 to 102 boxes of chocovron at 8 pcs per box for approximately 816 pcs. Wholesale price is also P75/box and, she provides a discount when the consumer buys more packs. Retail price of the chocovron is P120 in Banawe and P85 in Lagawe.

She owns a customized oven that can accommodate several cookies pan in one baking. A tank of gas, Shellane, lasts for 2 weeks. There are at least two to three workers during the production: two regular hired female workers and one or two family members. She has an on-call worker who occasionally helps especially during the peak months of production. Payment for workers depends on several factors: the skill of the worker, their capacity to reach the target volume, and the number of boxes ordered. The design of the packaging material comes from her personal concept executed by a designer she hired. She contacts government agencies such as the Department of

Science and Technology (DOST), the then Bureau of Food and Drugs (now Food and Drug Administration, FDA), and others for tasks such as inspection of the production area and nutritional analysis of the products, but her products are still not yet registered with the FDA to date.

3.3. Linkages between value chain actors

3.3.1. Trade Flow of Heirloom Rice

The FGD was conducted among selected members of the provincial cooperatives to inquire and probe on the flow of the harvested heirloom rice from the farmers to different market channels until it reaches the final consumers. As members of the cooperative, they are required to supply a fixed amount of unmilled/unprocessed paddy but there are some farmers who supply higher volumes than required, as gathered from the individual interviews. The following section describes the flow as narrated by the cooperative members. It documents all the channels through which heirloom rice flows and each step where value is added to the product. During the period of the study, the provincial cooperatives in Kalinga (KRTFAC), Mountain Province (MPHRFAC), and Benguet (BHRFAC) were fully operational while the cooperative in Ifugao (IHRPC) has not yet formally started.

3.3.1.1 Mountain Province cooperative members

The MPHRFAC was formed in 2016 with its current 83 members (as of January 2020 DA-RFO CAR) from the municipalities of Barlig, Bauko, and Tadian. It has been playing a vital role in consolidating and processing heirloom rice paddy (paddy flows depicted in Figure 21 through interrupted arrows) and in distributing processed (bold lines) heirloom rice to the processors, distributors, and retailers. The heirloom rice collected from the members of the cooperative are milled using a customized mill procured with HRP assistance. The cooperative then supplies processed heirloom rice to processors of rice wine, flour, coffee, and cakes, to distributors like the LGU, and to retailers before the products reach the local consumers. Processed, milled, and cleaned heirloom rice can also flow directly to the processors and local consumers without passing through MPHRFAC. The local consumers include people in the locality, private individuals—neighbors, friends, relatives—government employees, and tourists/visitors within and outside the country. The heirloom rice reaches final consumers, indirectly through the MPHRFAC, and directly from the processors and from the heirloom rice farmers themselves.

In some instances, heirloom rice grains and processed products from Mountain Province are showcased in trade fairs such as those held in Baguio City. While this study was being conducted, the LGU employee in Bontoc received an order from a distributor in Manila for 100 kg per month of purple rice (Balatinao or Ominio) to be transported through a public bus and paid through bank transfer when the product is received. An OTOP store in Bontoc sells heirloom rice wine along with other non-rice products of the province. Heirloom rice and processed products are one of the featured products during the Etag festival in Sagada.

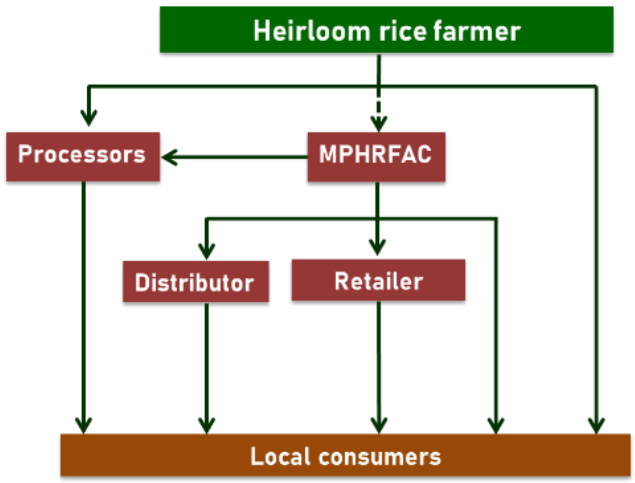


Figure 21. Trade flow of heirloom rice in Mountain Province
Legend: → processed HR - -> paddy

3.3.1.2. Kalinga cooperative members

The KRTFAC was created in 2014 and currently has 103 members from the municipalities of Pasil and Lubuagan. These municipalities had been the place where Mary Hensley, a US Peace Corps volunteer[13], started her work with heirloom rice farmers in December 2004. The heirloom rice farmers suppliesd rice paddy to the provincial cooperative and unpolished rice to the processors and the local consumers. KRTFAC members are required to share part of their harvest in paddy form with the cooperative which the latter will process using a custom mill. The cooperative then distributes the milled rice to the wholesalers in their municipality and nearby areas and to local consumers. The wholesalers buy in sacks and further clean the milled rice which they then sell to the processors and retailers. One of the retailers in the province is the OTOP store which repacks the milled heirloom rice into a container (usually in volumes of 1 kg net weight per pack) with a specific design/logo and featuring the place of origin, Kalinga, on the packs. Buyers from this retailer are clients/customers of the restaurant-shop and government offices who offer the rice packs as souvenirs to visitors and guests.

The processors of the rice products have three sources of processed heirloom rice: the retailers, wholesalers, and the farmers themselves. The processors often experience shortage of supply; hence, they have to contact different sources to check the availability of heirloom rice. A processor in the province processes heirloom rice products such as rice wine, chili paste, and champorado.

The flow of the heirloom rice trade in Kalinga (Figure 22) reveals an additional channel downstream from the cooperative, i.e. the wholesaler who sells processed heirloom rice to the retailers. One reason for this is the nature of the retailer of heirloom rice, the OTOP, which is a modern retail store that markets other Kalinga products for tourism promotion. The retailer prefers to purchase from a wholesaler to lessen the cleaning or further processing of the rice grains and for the customized packaging.

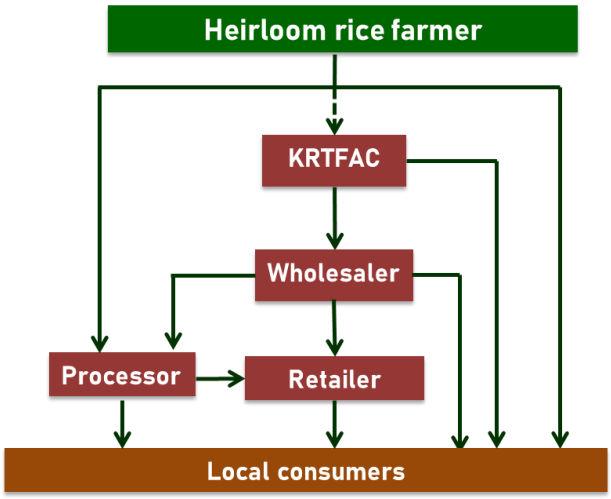


Figure 22. Trade flow of heirloom rice in Kalinga
Legend: → processed HR - -> paddy

The following figure (Figure 23) illustrates the production and marketing players of heirloom rice in Kalinga and the prices of the heirloom rice variety Chong-ak at different levels. The source of information for the production cost

[13] Mary Hensley was Peace Corps volunteer who was an early advocate and exporter of heirloom rice. https://www.heirloomrice.com/

and marketing cost was from the Kalinga SUC study (Ganotice et al 2016), while the prices of Chong-ak came from the participants of the FGD, midstream actors, and retailers in Kalinga. The production cost which is mainly composed of the labor used in producing heirloom rice amounts to P47.00/kilogram[14], and the marketing cost—which is mostly for processing the heirloom rice grains—is P4.86/kilogram; hence, the total cost is P51.86/kilogram from production to retail. For Chong-ak, the prices per kilogram were P60.00/kg for the farmgate price, P140/kg for the wholesale price, and P150/kg for the retail price, hence, a price margin of P90/kg from farmgate to retail, as well as a margin of P80/kg from farmgate to wholesale.

The figure shows the high production cost shouldered by the farmers who sell Chong-ak at P60/kg as compared to the recommended farmgate price of P90/kg in the HRP Phase l VCA. The wholesale and retail prices, however, are at par with other heirloom rices, providing a higher profit margin for midstream actors. This implies a need to investigate why the heirloom rice farmers did not follow the recommended price, if not by individual farmers then at the cooperative level. The heirloom rice farmers of Kalinga should be given feedback on this, showing the two scenarios of the farmgate prices—their adopted price and the recommended price which would provide a higher income for them. Their lower price could undermine the efforts to raise the farmgate price of heirloom rice.

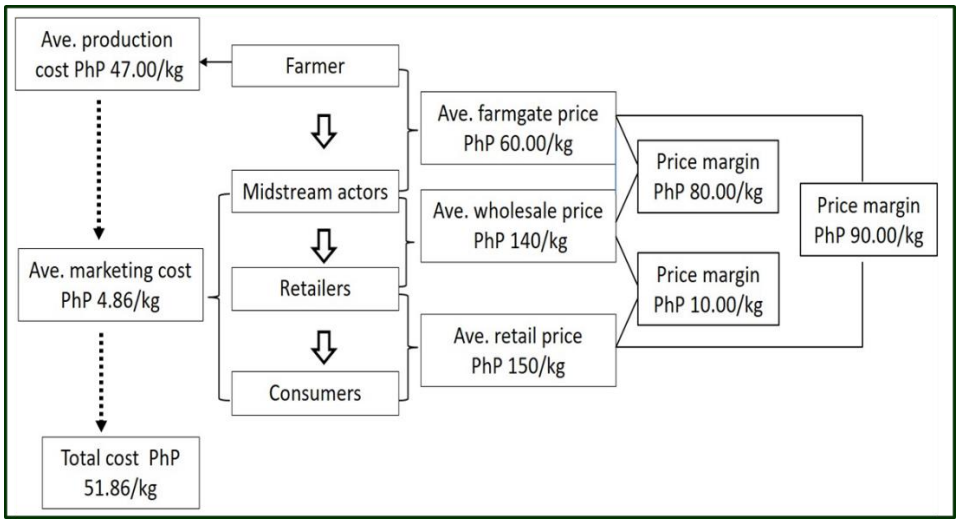


Figure 23. Production and marketing players of heirloom rice farmers in Kalinga (Chong-ak)

3.3.1.3. Benguet cooperative members

The BHRFAC was registered and started operations in June 2017. The number of members is currently 68 coming from different municipalities of the province. The participants of the FGD were from the municipalities of Kibungan and Bakun, two of the three sites of the HRP. From the heirloom rice farmers, the harvested paddy is milled before they flow down the different channels of the value chain. Several of the participants revealed that in almost all of the villages, there are privately owned rice mills. Processed heirloom rice grains flow to the BHRFAC, wholesalers, local markets, and local consumers. From the BHRFAC, heirloom rice is sold either directly to local consumers or to wholesalers, and from them to retailers, who then sell them in local markets. The processed heirloom rice can be accessed by the local consumers through the BHRFAC, retailers, local market, and from the heirloom rice farmers themselves (Figure 24).

Unlike in the three provinces of Mountain Province, Kalinga, and Ifugao, the heirloom rice in Benguet is already processed at the farmer stage before it flows to the other channels. Benguet is also known to produce vegetables which are high-value crops and highly in demand. However, because of the perishable nature of vegetables, vegetable farmers are vulnerable to huge losses when they are unable to bring their produce to the market.

[14] The cost of production is relatively high compared to the cost of production of lowland irrigated rice which is P12.41/kg from the study conducted by Bordey et al (2016)

Benguet rice farmers continue to produce heirloom rice more for their own consumption and because of its more resilient shelf life.

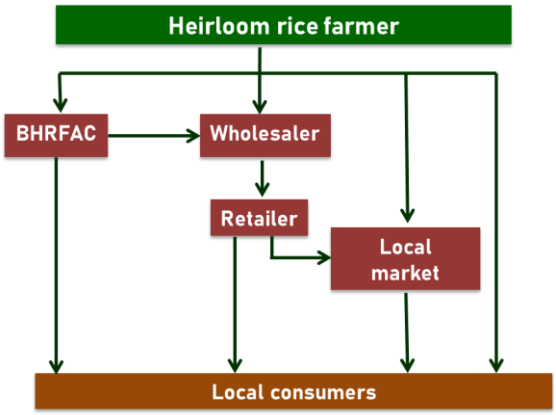


Figure 24. Trade flow of heirloom rice in Benguet

3.3.1.4. Ifugao cooperative members

Among the four provinces, the cooperative in Ifugao (IHRPC) has not moved from its initial stage after the orientation and pre-membership seminars/workshops conducted in 2016; i.e., the same year when the three provincial cooperatives had their orientation. One of the reasons for this is the presence of the regional cooperative (RTFC) in Banaue, Ifugao whose main task is to consolidate the heirloom rice harvested in CAR. During the last quarter of 2019, a cooperative orientation seminar was conducted as a refresher among the farmers who had attended the first orientation seminar. The cooperative members who attended the FGD came from Kiangan, Hungduan, and Lagawe. The participants from Hungduan revealed that since the provincial cooperative is not fully operational, they have their own producers' organization in their municipality. The Hungduan Heirloom Rice Producers Organization (HHRPO) and RTFC accepts heirloom rice paddy from their members, and both organizations act as consolidators of rice paddy (Figure 25). The RTFC started consolidating heirloom rice from Ifugao and Kalinga (Rice Inc, 2006), then extended to the Mountain Province (Rice Inc, 2007). The HHRPO distributes processed heirloom rice to processors of rice products—cookies, cakes, etc.—and to the RTFC; the RTFC, in the same manner, also processes heirloom rice then sells to local consumers. The processors of heirloom rice products are able to showcase their products in exhibits, the most recent of which was in Isabela Province, through which the products are able to reach consumers outside CAR. There are heirloom rice farmers who manually process their heirloom paddy and sell to the Municipal Agricultural Office (MAO). The MAO further cleans and packs in well-designed and labelled packages which are sold to local consumers or sent to display centers—such as the Hukab and Lagawe trading post—to buy in bulk and sell to local consumers there as well as to local tourists. Heirloom rice farmers also sell manually processed heirloom rice directly to local consumers but the material and way of packaging varies among farmers.

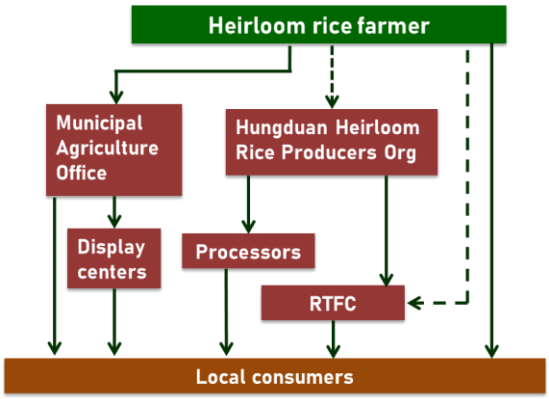


Figure 25. Trade flow of heirloom rice in Ifugao
Legend: → processed HR --> paddy

The flow of paddy heirloom rice is not restricted to one group but to two groups who have the capacity to process the heirloom rice before it reaches the processors or local consumers, these are the HHRPO and the RTFC.

3.3.1.5. CAR—Mountain Province, Kalinga, Benguet and Ifugao cooperative members

Provincial cooperatives require about 25 – 35 kilograms paddy as their members' contribution, but there are members who supply more than the required volume[15]. The trade flows of heirloom rice in the four provinces reveal that since the creation/inception of the provincial cooperatives, the processed heirloom rice and products have reached local consumers within and outside of CAR or the domestic market. This is in contrast with the findings of the VCA in Phase I (2014–2016), during which heirloom rice has reached the international market. The RVCA conducted in 2014 was combined with the findings of the project "Value Chain Analysis Study for Aromatic Pigmented Rice for Luzon" of the PRDP of DA. The RVCA was conducted by the partner-SUCs of the DA-IRRI HRP in the four provincial project sites, with the assistance of researchers from DA-RFO CAR, PhilRice and IRRI. The trade flowcharts of the four provinces and for CAR are shown in Annex 3. The flow of heirloom rice to the international market was initiated by Mary Hensley, a then US Peace Corp volunteer in Kalinga in the late 1970's. She founded the NGO Eighth Wonder, Inc. in partnership with Vicky Garcia of Rice Inc. who provided the link from the heirloom rice farmers and the RTFC that consolidates the heirloom rice harvest in Kalinga, Mountain Province, and Ifugao, enabling heirloom rice to reach the international market (HRP Phase I Project Report 2016). The NGO took care of the final processing and packaging of its products, but at that time, they sourced heirloom rice at a farmgate price of P40–60/kg. With the recommended higher price of P90/kg, they were unable to sustain their business. Consequently, during 2005–2016, annual exports of heirloom rice—mainly to the United States—reached approximately 27.5 metric tons, but then, operations were ceased (https://www.heirloomrice.com). According to Bairagi et al (2021), this export volume was insufficient to significantly expand market access of heirloom rice farmers.

Recommendation and future research endeavor. The trade flow of heirloom rice in CAR based on the individual trade flows in the four provinces is depicted in Figure 26. It is a consolidation of all the four trade flows per province and this was verified and confirmed by DA-RFO CAR. Aside from the trade flow from the heirloom farmers the DA-RFO CAR added a flow from the wholesaler direct to the local market and from the heirloom rice farmers direct to the local market.

[15] recorded from the individual farmer interviews

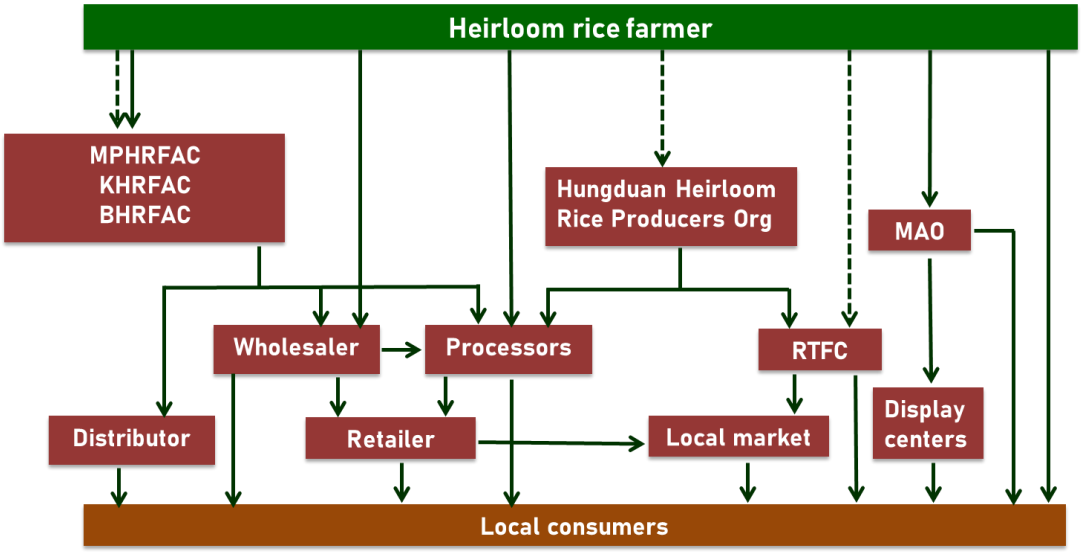


Figure 26. Trade flow of heirloom rice in CAR

Legend: → processed HR - -> paddy

With the combined information from the cooperative members and feedback from DA-RFO CAR, the trade flows can serve as a basis for further tracing the sources and end-users to improve the marketing system of heirloom rice in CAR. In addition, it would also be more comprehensive if by-products produced are incorporated into the marketing channels, and an information of approximate proportions of the total production that flow along the different channels.

3.4. Related aspects in the value chain

3.4.1. Farming

The farmer is the main actor in heirloom rice production. In the FGDs, the participants described their production practices while in the individual interviews, the respondents quantified the labor participation of male and female members of farm households, and other labor sources such as exchange or hired labor. Concise information to assess the appropriateness of the increase in the farmgate price of heirloom rice varieties as suggested in Phase I or to further increase the current price per kilogram is presented.

3.4.1.1 Weather and cropping season

The Cordillera region has three distinct weather conditions: rainy, warm, and cold weather (Figure 27). These weather conditions overlap within a month or a week in the month. For the provinces of Kalinga, Ifugao, and Mountain Province, rains usually come in the month of May and extend until December. These months also correspond to the onset of land clearing and land preparation activities for the wet season. September to February are the cold months, which overlap with the rainy season that lasts until February. Harvest time for the wet season is during the months of October to November where heavy rains come; hence, most farmers opt not to plant rice in the wet season. Dry season starts in December up to January of the next year and ends in April to May. The period from the end of February until May includes the warm months coinciding with the maturity of the rice plant until harvest. During this time, farmers are able to dry their harvest and store it with the right moisture content in their storage place in the house or in the rice granary located in the farm.

Extreme weather changes have been experienced in Mountain Province from 1995 up to 2000. The super cold weather accompanied by strong winds usually occurs during the months of September to January. This is followed by warmer summer conditions with some rice varieties observed to be sprouting before the usual period. The FGD participants commented that this somehow changed the maturity of the rice plants including the heirloom rice varieties.

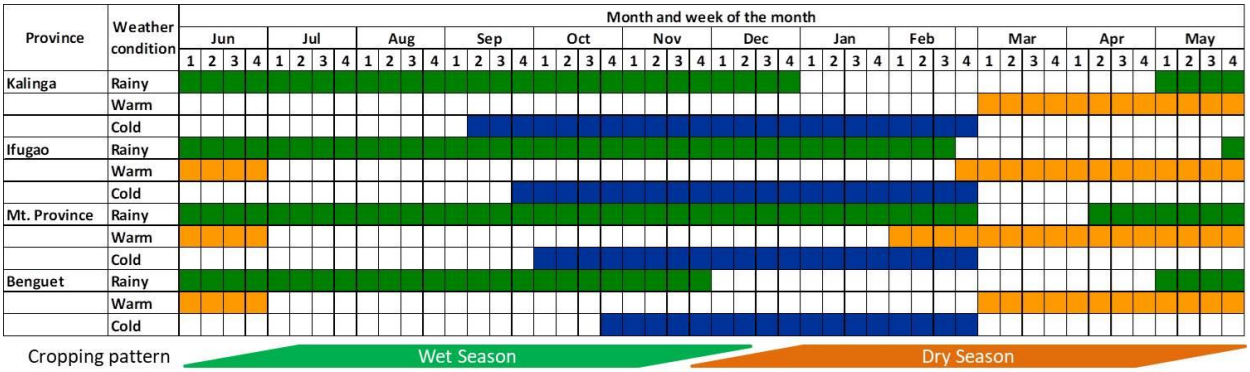


Figure 27. Weather and cropping calendar of the Cordillera heirloom rice

Varied observations on the changes in the weather were narrated by the participants from Ifugao. In Kiangan, the farmers said they have not observed much change in the climate. However, in Hungduan, which is located in the upper elevation, the farmers there experienced warm weather which is almost the same in Lagawe, located in a much lower elevation of the province. Rain occured year-round in Lagawe and as a result, the participants in the FGDs claimed to be unable to predict the occurrence of insects and diseases of the rice plant. One distinct weather change over the last five years is the occurrence of rain even during the summer months, with the continuous downpour from August to October leading to the erosion of the rice terraces.

The participants from Benguet narrated that in 2015, they experienced extreme coldness ("super cold") which led to the frosting of the rice crops and other plants and vegetables planted on the mountain top. Though it was only for two months, October to November, this affected the panicle initiation of the rice plants due for harvest in December.

The participants from Kalinga were from the municipalities of Lubuagan and Pasil, which are sheltered within the mountain ranges, hence the weather in their locality was perceived as not having changed much.

3.4.1.2. Cropping calendar

In Activity 2, the respondents were asked to provide information on their production practices and the corresponding months when they conduct each practice. Figure 28 shows the cropping calendar for one season of heirloom rice production in the three provinces. Land preparation is usually conducted starting in October. It includes activities such as plowing, harrowing, leveling, and trampling. This is immediately followed by seedbed preparation. Maintenance and care and the management of seedlings are also conducted in the fourth quarter of each year until January. Depending on the maturity of the rice plant, transplanting is done starting from December up to March. Harvesting is done from May to August, depending on the variety and location. Hauling, winnowing/sorting/cleaning, drying, and threshing are done during the same period. Although there are no strict months for activities such as weeding and management of pests and diseases, the farmers still reported the months when they conducted these activities in the past cropping season. Also, irrigation/water management is usually done when the rice plants have been transplanted.

3.4.1.3. Production practices

Majority of the production activities are still done traditionally, i.e., manually, by the farmers with the use of carabao to some extent. They use their hands and feet to puddle and mix the soil. They use raw materials from naturally growing plants in the area as fertilizers or insect repellants. Irrigation water sources are from natural springs, creeks, and rivers that traverse the terrace areas. The farmers use small gadgets to cut grasses, weeds, and other plants, and a scythe to harvest by panicle. To haul and transport their harvest, they use either plain bamboo/wooden poles or poles with twin baskets tied to each end. Aside from this information, the participants were also asked about any improvements or innovations they made in performing their production practices.

Table 16 presents a summary of the traditional practices in farming activities and the doers of the activities, as well as innovations or improvements introduced by government and non-government offices or institutions.

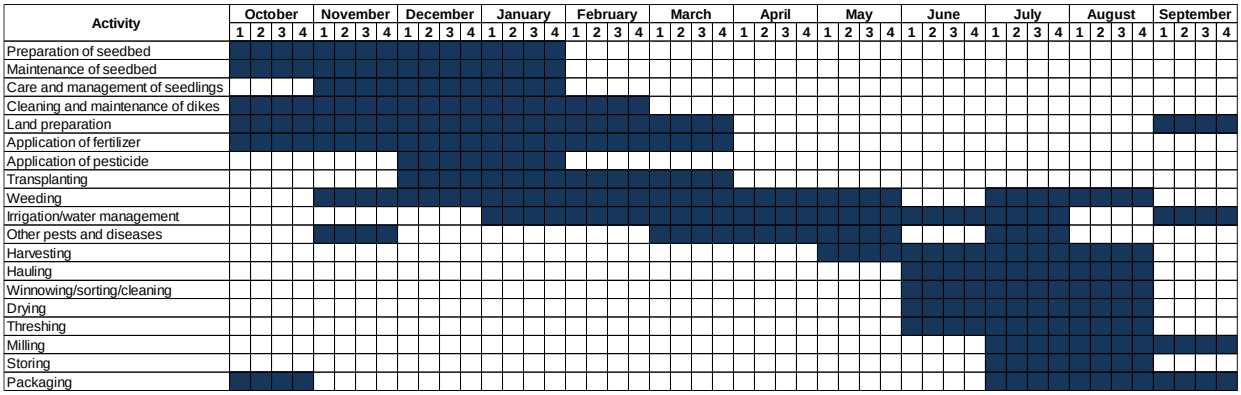


Figure 28. Cropping calendar of heirloom rice production in CAR, 2019

Table 16. Summary of traditional practices, labor participation of men and women, and corresponding innovation, by farm activity.

Farm activity	Traditional heirloom rice farming		Innovations/ improvements
	Practices	Labor contribution of men and women farmers	

a. Clearing/ cleaning/ repair of dikes and terraces	• Manually repairing and cleaning of dikes, terraces, and irrigation canals
	• Use of hands in:
	  • Removing weeds & other plants in dikes and terraces
	  • Collecting rotten or decayed materials (rice stalks, water weeds, fern, water hyacinths, & other leafy succulent plants)
	• Use of local gadgets to cut hard portions of weeds or plants, which are thrown outside the terrace area
		• Men do the clearing, cleaning and repair of dikes and terraces, carrying rock, stone, and soil
		• Men remove and cut the bigger and harder plants
		• Women collect the cut plants and floating plants in the terraces
			• Use of sickle (Figure 29a)
			• Use of grass cutter

b. Seedling preparation and maintenance	• Seed in stalks are lined three inches apart (Figure 29b), spread over drained seedbed • Seedbeds are drained to prevent golden apple snail infestation & to correct soil acidity • Soil is drained and exposed for one week • Transplanting seedlings when they are 30-40 days old	• More women are visible in the field • Women do the sowing or planting of the seeds which are still in the stalks • The women constantly visit the seedbed until the seedlings have fully grown and are ready for transplanting	• Mix carbonized rice hull into the seedbed soil (Mountain Province) • Broadcasting in sowing seeds in Benguet (Figure 29c)
c. Land preparation—trampling, plowing, harrowing, leveling	• Trampling of weeds & other collected materials into the soil by feet • Field is left for a week to let the materials decay and be incorporated in the soil • Plowing, harrowing, and leveling are done manually with the aid of carabao and indigenous tools	• More women are visible in the field	• Use of hand tractor in land preparation (Benguet) • Use of rotavator & microtiller customized to fit the size of the terrace
d. Organic fertilizer application	• Use of decomposed materials during 1st stage of land preparation • Mixing the decomposed materials with newly collected weeds, leaves, & other fresh materials after harrowing • Use of sunflower & other shrubs • Use of shrubs ("wakar" vines, "bulo"), known to have zinc component	• Men and women work together in this activity	• Rice hulls & rotten legumes are placed into the field & sprayed with indigenous microorganisms for easier and faster composting (Mountain Province) • Use of fermented

Farm activity	Traditional heirloom rice farming		Innovations/ improvements
	Practices	Labor contribution of men and women farmers	
			fruit juice and fruit plant juice which are being applied at reproductive stage (Benguet through PhiRice's FFS program)
e. Pesticide management—insect, mollusk, rodent	• Handpicking of pests during visits to the field • Planting of marigolds on the sides/edges of the terraces • Burning of rice hull (Mountain Province) • Use of 'Dongla' (red plant) to drive away insects and rodents, planted along the dikes and terraces • Hanging sugarcane near rice fields to attract the bugs during the mature stage of rice plants • Manually driving away leaf folders from the palay leaves	• More women are visible in the field • Women pull out stunted and insect-infested plants and replace these with healthy rice seedlings	• No improvements in practice were mentioned by the farmers
f. Crop establish-ment—pulling of seedlings, transplanting	• Synchronized planting to ensure plants mature at the same time & as a pest control management • Use of the 20 cm x 20 cm spacing in between rice plants • Transplanting 30-day-old seedlings	• More women are visible in the field • Women do the pulling of seedlings, washing off mud, bundling, and carrying them to the field to be transplanted	• Use of wider spaces between seedlings when using varieties with good tillers (Benguet)
g. Weeding	• Handweeding • Doing constant field visits	• More women are visible in the field • Women go to the rice fields for hand weeding, carefully walking in between the rice plants • Women do thinning and redistributing the plants if there is crowding in one portion	• Use of sickle • Use of grass cutter
h. Disease management	• Removing rice plants affected with bacterial blight (Ifugao) • Removing plants affected with sheath rot at harvest season & when weather is humid • Looking for any sign of false smut but farmers refrain from doing any action to get rid of this if not severe • Manually looking for plants affected with neck rot infestation (Benguet)	• More women are visible in the field	• No improvements in practice were mentioned by the farmers
i. Irrigation/ water manage-ment	• Use of natural sources of irrigation water such as creeks, springs, rivers • Use of communal irrigation systems	• The men conduct regular checkup of the irrigation system • Women also maintain the water spillways to make sure that rice paddies have adequate water supply	• No improvements in practice were mentioned by the farmers
j. Harvesting	• Manual harvesting, cutting the sheaf one by one, after a handful the leaves are removed then the stalks are bundled • Selecting seeds from the first harvest for the next cropping—healthy rice stalks with robust and heavy grains are selected • Use of traverseharvest knife or finger-bladed knife (*rakem*) (Figure 29d) • Preparing the bamboo strips used to bundle and hang the harvested rice sheaves	• Harvesters who are predominantly women would go to the field early in the morning to start harvesting the rice • Seed selection is typically done by women	• No innovations in harvesting
k. Hauling	• Placing the gathered and bundled rice stalks in a wooden pole • Storing these in a granary (*alang*)	• Men tie the bundled rice stalks on both ends of a wooden pole and carry the pole on their shoulders by	• No innovations in harvesting

Farm activity	Traditional heirloom rice farming		Innovations/ improvements
	Practices	Labor contribution of men and women farmers	
		straddling and balancing it from the center	
I. Postharvest	• Winnowing • Drying • Threshing • Milling • Storing • Packing	• Mostly performed by women: • Use of wooden mat • Putting the grains inside sacks to dry on the road • Hand pounding • Storing the grains in ordinary sacks	• Solar bubble dryer • Moisture meter • Micro length grader

a. Sickle or "kumpay" (left) and "salapsap" (right)

b. Panicle sowing of heirloom rice, Kibungan, Benguet

c. Direct dry seeding in raised seedbed (broadcasting method), Kibungan, Benguet

d. Finger-bladed knife (left) and transverse harvest knife (right) locally known as "rakem"

Figure 29. Photos of indigenous tools, (a & d) and methods of seeding (b & c).

Data on the labor participation of men and women show that there are specific farm activities that are done only by men and those that are only by women, while some others are done by both men and women. During the start of the farming season, the men are the most visible or almost only the men are involved in the clearing and land preparation, including other activities that require physical strength in carrying heavy rocks/stone, moving the soil, and cutting big stubborn plants. Women work on the field during crop establishment and are the only ones mostly visible in the field in taking care of the rice crop during pest and disease infestation, in maintaining terrace water flows, and in handweeding—all tasks which are time-consuming and very repetitive. Although both men and women join in harvesting, some postharvest activities are mostly done by women.

The innovations and improvements introduced involve the mechanization of rice production[16] during the land preparation stage, an activity that is traditionally done by the women. Several studies on appropriate technologies were developed for women for farm and household uses (IFAD 2016; Polar 2015; Paris and Chi 2005; Diaz et al 1999; Paris et al 1994; Paris 1989), with women involved in the development and testing of the technologies. These technologies—tractor rotavator and microtiller—were perceived to lessen the drudgery and time required to do the work. A key observation was that these technologies, aside from being customized to fit the size of the terraced land in CAR, should be light enough for a group of women to be able to move them from one terrace to another.

Postharvest activities are seen as another opportunity to introduce technologies to improve the quality of the rice produced in CAR (Sandro et al 2020). The HRP has started to introduce technologies for different postharvest activities in CAR through cooperative activities such as during meetings. The farmers showed interest in having these technologies in their villages or cooperatives after witnessing the demonstrations on how these are

[16] Mechanization of rice production was initiated by the Philippine Rice Research Institute (PhilRice), Munoz City, Nueva Ecija

operated. The following provide a brief description of these postharvest interventions.

One of the most frequently mentioned technologies is the solar bubble dryer (Figure 30) which was piloted in Phase I. The farmers believe that using the solar bubble dryer will facilitate the drying of the paddy even during the rainy months, producing a cleaner paddy protected from impurities such as small stones from the road, and shortening the time of drying. However, one of the constraints of this technology is the required space to lay it on the ground, as flat land is limited in the mountainous Cordillera terrain.

Figure 30. Demonstration of the solar bubble dryer

The moisture meter is a decision-making tool for postharvest operations of paddy. There are three typical applications: 1) to check whether paddy in a dryer or in sun-drying is already dry enough to stop the drying process; 2) to assess whether paddy intended for milling can be stored safely; and 3) to determine whether rice seeds are dry enough to be stored safely, such as the case when seeds are intended to be stored in hermetic storage systems[17].

The use of hermetic storage systems is intended to control grain moisture content and insect activity[6]. The hermetic bag maintains the ambient moisture content at 14% which prolongs the shelf life of the stored seeds, keeping their viability and good quality intact.

The cocoon plastic (with a maximum capacity of 500 kg) is an airtight container which doubles as storage for heirloom rice paddy and panicles and for carbon dioxide (CO_2) fumigation. CO_2 fumigation is an acceptable form of organic fumigation that eliminates insects, particularly the rice weevil, in all life stages and prevents the development of mycotoxin-producing fungi (Figure 31).

Figure 31. Carbon dioxide fumigation storage

The rice micro length grader (Figure 32) sorts the milled rice by separating the unbroken grains from the broken grains. A significant amount of time and grains is saved compared to the traditional practice of winnowing. A redesigned prototype was developed to accommodate a bigger capacity or volume of milled rice.

Figure 32. Demonstration of the micro length grader

The compact rice mill (Figure 33) produces semi-polished or polished rice. Compared to the customized rice mill, the compact rice mill performs better in terms of milling recovery and percentage of unbroken grain vs. broken grain. As it is more compact, it is space-saving as well as labor-saving as it can be operated by just one person.

Figure 33. Compact rice mill

In line with developing the marketability of the product, packaging machines were demonstrated in the HRP sites. There were two types of vacuum packaging machines introduced: the cuboid 12 kg capacity (1 kg and 0.5 kg per pack) and the flat 1 kg capacity. During the dry-runs, preparations for the cuboid vacuum packaging took more time compared to the flat vacuum packaging. A comparative study is proposed to determine the efficiency of these vacuum packaging machines.

[17] IRRI Rice Knowledge Bank

Farming practices described by the participants in the FGDs

a. Clearing/cleaning of dikes and terraces. In the clearing and cleaning of the terrace areas, farmers remove the weeds on the dike and in the fields using small tools. All weeds are usually thrown in the paddy field to be decomposed first before trampling during the land preparation stage. Aside from cutting the weeds and other grasses, they also remove rotten or decayed materials such as rice stalks, water weeds, ferns, water hyacinths, and other leafy succulent plants. In some cases, the roots of the grasses are left on the dikes to keep the soil intact. Some repairs of the dikes and terraces are also done during this stage.

The use of grass cutters and sickles had been introduced as innovations for this stage in land preparation.

b. Seedling preparation and maintenance. Planting of the rice seedlings usually begins in July for the wet season and in January for the dry season. In some areas the seeds in stalk are neatly lined in the mud about three inches apart and spread over the drained seedbed while in other areas, threshed palay are sown in the prepared seedbed. Heads of rice are laid in the middle of the field to prevent them from being eaten by rats or birds. In Bauko, Mountain Province, the age of seedlings for transplanting is 45 to 60 days. As with the other participants of the FGD in Ifugao, Kalinga, and Benguet, farmers in Mountain Province believe that the longer the seedlings grow in the seedbed, the sturdier they become, even withstanding biotic and abiotic stresses better.

They also said that the soil in CAR is still very fertile and as such farmers do not need to apply any inorganic fertilizer like ammonia. To prevent the infestation of golden apple snails, the seedbeds are dried first before the rice crop is planted. Drying of the soil at this stage is also practiced in Ifugao to correct its acidity. The rice fields are drained for one week and exposed to the sun before planting. This becomes a problem when rains are continuous or occur out of the expected cycle.

One of the improved practices in seedbed preparation is to mix carbonized rice hull into the seedbed soil. The picture shows Mr. Ramon Calde from Mountain Province with his rice hull carbonizer and carbonized rice hull in vegetable plots (Figure 34). This makes the soil more loose so it becomes easier to pull the seedlings for transplanting.

Figure 34. Rice hull carbonizer

Participants from Benguet use broadcasting method in sowing the seeds during the wet season. About 95% of the farmers prefer broadcasting because it saves time and labor, and they can select the good seeds unlike in the panicle planting where there may be empty grains or unhealthy seeds planted together with the good ones in the seedbed.

c. Land preparation—trampling, plowing, harrowing, leveling. The land is prepared by trampling the rotten weeds, plants, and stumps of rice straw into the soil (this serves as fertilizer). The land is left for a week for all the materials to decay and to be mixed with the soil. Plowing, harrowing, and leveling are usually done by hand with some basic tools.

Participants from Benguet shared that they use a hand tractor, locally called “kuliglig”, in land preparation. Given the means, they prefer their rice farms to be mechanized. When probed if women farmers also operate the machine, all of them answered yes, but they said the women still need the help of the male family members to transport the machines to the field. Ifugao participants also mentioned the need for mechanization of farming due to scarcity of labor in land preparation. Examples of machines used are rotavator and microtiller that are customized to fit the size of the terrace.

Problems related to land preparation were discussed in the FGDs. The most common problem across the four provinces is soil erosion and to address this, the men do riprap and reconstruction at the start of land preparation or when erosion occurs within the cropping season. During the last stage of land preparation, water in the rice field should be maintained at 2 cm since it would be too difficult to control when there is excessive water flowing to the

fields (Ifugao). Giant earthworm infestation (in Mountain Province and Ifugao) can erode 2 to 5 m of the rice terrace/field walls. This kind of earthworm had been in the field for about 10 years and a thread-like worm had started to infest rice fields for almost three years now (Joshi et al 2020). In the same manner, "kiwit" or eel was seen in the fields which were observed to cause damages like the earthworm.

The participants from Ifugao mentioned two different changes in the soil composition and/or texture which they observed during land preparation. In the past, they said that if they foot tramp the rice straw into the field, the rice straw easily decomposes and mixes with the soil. Recently, they observed that the soil forms distinct layers—beneath the top soil is cold, muddy water and underneath is clay soil—which they think is associated with zinc deficiency.

d. Organic fertilizer application. Materials for organic fertilizers— "green manuring"—are collected at the clearing and cleaning stage and are decomposed at the land preparation stage. After harrowing, the decomposed materials are mixed with newly collected weeds, leaves, and other fresh materials and are trampled into the soil. Rice hulls and rotten legumes are also placed into the field and sprayed with indigenous microorganism, or "IMO", for easier and faster composting (Mountain Province).

The use of sunflower and other shrubs was mentioned by the participants from Ifugao, a practice which they said had been used for several generations. In some terraces, sunflowers grow beside the rice fields but for those who do not have sunflowers near their fields, they use shrubs ("wakar" vines, "bulo") which are good for deeper mud and are known to be rich in zinc.

Aside from the use of sunflower as organic fertilizer, participants from Benguet revealed that 15-20% of heirloom rice farmers use organic concoctions in the form of fermented fruit juice and plant juice. They learned this during the Farmers Field School program of PhilRice. These organic concoctions are applied during the reproductive stage of the rice plant.

e. Pest management—insect, mollusk, rodent. The usual pest management practices in Mountain Province include applying burnt rice hull, planting marigold on the sides/edges of the terraces, and hand-picking pests while visiting the field. The participants expressed interest in training on organic formulations of pesticides.

The Ifugao participants mentioned the use of 'Dangla' (red plant) to drive away insects and rodents. This is very helpful to farmers who plant at a later date compared to the usual planting dates. It is planted near residences and is known as both an ornamental plant and a medicinal plant. It can be prepared as a tea for hemorrhoids and the leaves can be used to eliminate foot odor. It is also used in rituals.

The farmers also mentioned that rice bugs can be controlled or minimized by planting marigold or hanging sugarcane near rice fields to attract the bugs especially during the mature stage of the rice plants. They also manually drive leaf folders away from the palay leaves.

f. Crop establishment—Pulling of seedling and transplanting. The participants of the FGDs had been practicing synchronized planting to ensure that the plants mature more or less at the same time and also as a way of pest control management. When pests attack, the risks will be spread over a bigger population and everyone will be assured of some harvest.

In Mountain Province, the FGD participants mentioned that transplanting before was easier because of the soil quality. They said they wait for 30 days for the seedlings to have more tillers before transplanting them in the fields. They observe a spacing of 20 cm x 20 cm for the rice plants. They also no longer need to supplement the water in the field during the vegetative stage of the crop to increase yield.

In Ifugao, the farmers are planting late because of changes in the soil composition/layers. This results in lesser number of tillers. Non-synchronized planting also occurs due to lack of labor since some farmers have other engagements. The transplanting distance is the same as that observed by Mountain Province farmers with 20 cm x

20 cm spacing.

Benguet farmers also practice the transplanting distance of 20 cm x 20 cm when the soil is fertile. Farmers pointed out that the spacing should be wider when they are using varieties with good tillers.

g. Weeding. Farmers from the municipalities of Balatoc, Dangtalan, and Uma in Kalinga practice hand weeding. If there is abundant water, no weeds will grow except *marapagay* and *barsanga*. The only known solution to control these two weeds is constant monitoring and hand weeding. The weeds appear yearly and in every cropping season. Information regarding treatment of these weeds came from their ancestors and through their own experiences. There are no costs involved in dealing with these weeds. The use of grass cutters and sickles are perceived to cause other farmers to be lazy.

About twenty percent of farmers use weedicides due to lack of labor to do weeding. Farmers visit their rice fields once or twice per planting season to do weeding; and once to twice a week for regular inspection and maintenance.

h. Disease management. Farmers in Ifugao remove the rice plants infected with bacterial blight (causal pathogen: *Xanthomonas oryzae* pv*. oryzae)*. They usually discover sheath rot (causal pathogen: *Sarocladium oryzae*) during harvest season and when the weather is humid. The presence of false smut (causal pathogen: *Ustilaginoidea virens*) has been reported in Ifugao although this is not severe so the farmers do not take any action to get rid of the disease.

Benguet farmers mentioned that when neck rot (similar to rice blast disease) (causal pathogen: *Magnaporthe oryzae*) infests a rice field, it can wipe out an entire field of heirloom rice and farmers have to manually look for surviving rice plants. Even when harvested, the rice is not fit for human consumption and can only be fed to chickens. Isolated cases of false smut have also been reported in Benguet, but similar to Ifugao, is considered not severe.

i. Irrigation/water management. In Kalinga, sources of irrigation water are the spring, communal "ayak" irrigation system, and canal irrigation. There is no irrigation fee. Reported problems related to irrigation are drought, erosion, calamities, and distance to the source of irrigation. Thirty to 40% of the farm area in Balatoc and 85% of the farm area in Dangtalan experience drought while 85% experience excess water in Lower Uma. The farmers who experience drought just wait for the rains to come.

In Ifugao, sources of irrigation water are creeks and natural springs. The FGD participants reported, however, that the water is not enough for all fields in the terraces (especially those in lower areas). There are instances that when water is abundant in the fields, snails are also present and eat the rice seeds.

In Benguet, sources of irrigation water are springs, creeks, rivers, and rain. The farmers use hoses to transfer water to some terraces. Water is free but farmers report that it is insufficient since there is high competition for water.

j. Harvesting. Farmers in the four provinces still practice manual harvesting. There are no innovations in harvesting and most farmers are not practicing rituals anymore. However, some rituals are still being conducted, "Punnuc" and "Uya-uy[18]" are to be done after harvest and before planting, respectively. "Uya-uy" was previously practiced by farmers before harvest.

k. Postharvest activities. The postharvest activities of winnowing, drying, threshing, milling, storing, and packaging are mostly done by the women. They use light materials such as wooden mats and sacks for drying paddy along the road accessible to their house. The amount of heirloom rice that is hand pound is just enough for one meal

[18] Uya-uy is a dance performed before an activity, e.g., planting rice for abundant harvest or to reach the second level of the wealthy class; Punnuc is a ritual to mark the end of harvest season.

preparation. Most of these activities are repetitive but relatively light in nature.

3.4.1.4. Allocation of harvested palay and seed flow

The FGD participants came up with a consensus on the allocation or distribution in percentage of the harvested palay. The table shows that most of the harvests are kept for home consumption, except in Mountain Province where the glutinous heirloom rice variety Ominio is mostly used as their contribution to the cooperative and for selling (Table 17).

Table 17. Allocation in percentages of the harvested heirloom rice (FGD).

Allocations/Uses of heirloom rice	Mountain Province		Ifugao		Benguet
	Member of HRP-assisted cooperatives		Member of HRP-assisted cooperatives	Non-member of HRP-assisted cooperatives	Member of HRP-assisted cooperatives
	Glutinous	Regular			
Home consumption	15	75	70	45	65
Stored for next season	10	10	1	10	3
Selling	20	5		25	
Seed exchange					2
Cooperative share	25	5	27		26
Rituals	15	3		10	2
Given to neighbors/ gifts	15	2	2	10	2
TOTAL	100	100	100	100	100

Similar information was gathered from the individual farmer interviews validating the practices on the disposal of harvested palay. Use of heirloom rice for home consumption remains to be the most common practice. This is one of the hurdles of the commercialization of heirloom rice.

3.4.2. Distribution

The distribution for processed heirloom rice grains is through the agricultural cooperatives in the provinces and in the region. Members bring their share to the cooperative in paddy form and usually during the dry season cropping. The collected shares of the farmers are milled by the cooperative and sold to traders, processors, wholesalers, and retailers.

The traders and wholesalers distribute the heirloom rice grains to a wider scale beyond their province of origin, within and outside of CAR. One of the emerging distribution channels is the use of online shopping, with Lazada and Shopee as the most common e-commerce platforms.

Heirloom rice wine is distributed from the processors to wholesalers or to retailers. The minimum quantity of rice wine bought for wholesale or retail is one box consisting of a dozen bottles. Among the different processors encountered during the research study period, the Gabay rice wine (Figure 35) processor seems to have a wider network of wholesalers/retailers. It is sold at a wholesale price of P130/bottle and a retail price of P180/bottle. This wine is sold in almost all the stores along the busy street of Sagada and at the OTOP shop in Bontoc, both towns in Mountain Province.

Figure 35. Gabay rice wine

Heirloom rice cookies/bites, crunch, and chocovron are delivered or picked up from the source. After only a year into processing cookies, the processor interviewed for this project was able to establish a network of outlets: at the Kiangan OTOP shop, Lagawe pasalubong center, different tourist shops in Banaue, JM Restaurant Payawan, and the DTI Hub in Baguio City. The products are picked up in the store by nearby retailers or sent by bus and most often on a cash-on-delivery arrangement.

For the processed traditional products such as the *patupat* or *linapet*, these are distributed to retailers who pick up the product from the processor's residence. Most often the processor does the marketing of the product directly to the final consumers.

Processed heirloom rice grains and processed products are also distributed in trade fairs or trade exhibits. The processors who attend these fairs gain two things: they are able to sell their product as well as learn about other products marketed in the exhibits.

In most cases for the processors of heirloom rice grains and products, they themselves are the sellers of their product to the final consumers.

4. ATTRIBUTES AND QUALITIES OF HEIRLOOM RICE

Farmers' classification of heirloom rice varieties according to quality and usage

Asking about the quality of heirloom rice from the producers themselves can give a gauge of how they regard their rice as well as whether their knowledge about it is at par with that of other people or the consumers. The participants were asked one at a time these questions: "What for you is a premium quality heirloom rice?" then" What is a good quality heirloom rice?", and lastly, "What is a low-quality heirloom rice?" They were asked to define or describe each quality, after which they were asked to list which heirloom rice varieties can be classified as premium, good, and low quality. The responses of the participants for each province are summarized in Table 18.

Table 18. Classification by quality of heirloom rice and corresponding varieties.

Province	Premium quality rice		Good quality rice		Low quality rice	
	Definition	Varieties	Definition	Varieties	Definition	Varieties
Kalinga	• Aromatic • Rich in fiber & nutrients • Soft	• Chong-ak • Ulikan • Chaykot	• Soft and round	• Ulikan • Alig	• Hard • Not sticky • Elongated	• Oyak • Waray
Mountain Province	• Organically grown • Black rice • Red rice • Aromatic • Brown rice	• Ominio • Balatinao • Gilgilang/ Dolyasi/ Akangan • Fiakrar (Barlig) • Chor-chor-os • Kotinaw (Sadanga) • Saluyao	• Organic with white color • Pure/no mixture • Full grains/ no broken grains	• Ladokan • Waray • Finggawan • Laminad • Pinawid • Baay • Intan	• Hard rice • Mixed varieties • Infested by rice weevils • Smelly • Broken grains • Polished	• No varieties are low quality, but depends on how the heirloom rice was processed, e.g. drying
Ifugao	• Good cooking quality (not easily spoiled even after two days) • Gives a feeling of fullness of the stomach (satiety) • Red rice • Health benefits • Organically grown • No broken grains	• Minaangan • Imbanig • Dolkitan • Madduli • Botnol	• Not easily infested by weevils • Could be mixed with other varieties	• Bongkitan • Donaal	• With impurities • Hard rice when cooked; easily breaks because of incorrect moisture content when milled	

Province	Premium quality rice		Good quality rice		Low quality rice	
	Definition	Varieties	Definition	Varieties	Definition	Varieties
	• Pure grains					
Benguet	• Soft • Aromatic • Nutritious • Semi-polished • With antioxidants	• Balatinaw • Lasbakan • Kabal	• Same with premium quality but with lower anti-oxidants		• Non-aromatic • Hard • White	

The baseline survey report done during Phase I of the HRP reflected diversified information on the heirloom rice varieties grown in the region. There were 31 identified landraces in Benguet, 18 in Ifugao, 37 in Kalinga, and 45 in Mountain Province. It is a common practice to save a portion of their harvest as seeds for the next season. There might be a diversified number of varieties but there are top varieties that farmers grow.

Based on individual farmers' interviews, there are varieties which are grown only for home consumption and varieties which are intended to be sold. In Kalinga, for example, there are three varieties sold—Chong-ak, Ulikan, and Waray. As reflected in Table 19, Chong-ak and Ulikan are classified by farmers as premium quality heirloom rice. Some also sell the Waray variety, which was classified by FGD participants as low-quality heirloom rice. In Ifugao, farmers sell Minaangan, Madduli, and Gapas. Both Minaangan and Madduli were classified by FGD participants in Ifugao as premium quality heirloom rice. Gapas was not mentioned in the FGD and was not reflected in the list of varieties from the baseline survey. The sole respondent from the individual interview in Mountain Province reported to have sold Balatinao and Waray.

Table 19. Heirloom rice varieties grown for home consumption and for selling.

Province	Varieties grown for home consumption	Varieties grown both for selling and home consumption
Kalinga	Allogit*, Bongkitan, Botnol*, Camoros*, Mayawyaw*, Mila*, Oyak*, Pinangad*, Tokong*, Chaykot	Chong-ak, Ulikan, *Waray
Ifugao	Botnol*, Bigot*, Binong-ol*, Imbanig*, Imbuucan, Inabin*, Inaawi, Nunaayan*,	Gapas*, Madduli*, Minaangan, Innawi
Mountain Province		Balatinao, Waray*

*Not in list of varieties characterized from the Phase I report

**Other varieties reported but we do not have information on % sold or consumed at home: Bongkitan and Tilopong (Kalinga); Red rice, Mountain violet, Ingkitan, Layagan, Hukbaba, Gumalangan, Bongkitan (Ifugao); Red intan (Mountain Province)

5. CUSTOMIZATION PRACTICES AND QUALITY ATTRIBUTES OF HEIRLOOM RICE CONSIDERED BY RETAILERS

We asked the retailers about their considerations when determining what varieties to sell. As previously mentioned, the retailers interviewed depicted two types of market: the modern market (OTOP) and the traditional market (public market).

The modern market retailer mentioned two important considerations: there should be available supply and no broken grains. She prefers to sell Chong-ak in their store. When asked about what her definition of premium quality rice is, she gave the following attributes: no broken grains, uniform sizes, soft when cooked, good physical appearance, and its characteristics do not change over time after it is milled.

The traditional retailer sells heirloom rice to have additional income. This traditional retailer rents a space at the Sagada Public Market and sells a variety of items. She started selling heirloom rice in 2016, preferring the purple (Balatinaw) and red (Magumbal) heirloom rice varieties which the supplier delivers every Saturday. The volume of heirloom rice she sells ranges from 36 to 48 kg per month. Apart from the rice she sells at the public market, she also supplies rice to a buyer based in Manila. She sells the heirloom rice at P120/kg.

Both the modern and traditional retailers repackage the heirloom rice using their own packaging designs and labels (Figure 36). The modern retailer sells the Chong-ak variety with the label Kalinga Unoy Heirloom Rice. She also sells the heirloom rice supplied by the KRTFAC.

The traditional retailer also packages the heirloom rice under the name Sagada Black Rice and Sagada Red Rice. The cost of the packaging material including the label for a one-kilo heirloom rice is P10.

(a) **(b)**

Figure 36. Packaging of heirloom rice by modern (a) and traditional retailers (b)

6. SELLING PRICES OF HEIRLOOM RICE BY VALUE CHAIN ACTORS IN CAR

Prices of heirloom rice differ per variety. In Kalinga, farmer-members of KRTFAC sell their harvest to the cooperative which in turn mills and packages the heirloom rice. There are certain varieties which are intended for selling, depending on the varieties grown in the province. In Kalinga, the rice varieties which are being sold are Chong-ak Unoy, Ulikan, and Camoros. In Ifugao, heirloom rice varieties being sold are Minaangan, Gapas, Innawi, Imbuukan and Madduli.

At the farmer's level, Chong-ak Unoy is sold at P60/kg, Ulikan at P65/kg, and Camoros at P65/kg (Table 20). KRTFAC sells Chong-ak and Ulikan at P140/kg, whether polished or not. KRTFAC sells milled heirloom rice to the modern retailer based in Tabuk City, Kalinga who in turn imposes a P10 price premium per kilogram. In Ifugao, farmers sell Minaangan at P70/kg.

Table 20. Selling prices of heirloom rice grains by value chain actors in CAR.

Province	VC actor	Variety	Rice form	Average price per kg (P)
Kalinga	Farmer	Chong-ak Unoy	paddy	60
		Ulikan	paddy	65
		Camoros	paddy	45
	KRTFAC	Chong-ak Unoy	milled	140
		Ulikan	milled	140
	Retailer	Chong-ak Unoy	milled, semi-polished	150
			milled, unpolished	150
Ifugao	Farmer	Minaangan	paddy	70
		Gapas	paddy	65
		Madduli	paddy	120[a]
	RTFC	Balatinao	milled rice	120
		Minaangan	milled rice	100
		Tinawon	milled rice	120
		Kotinao	milled/semi-polish	120
Mountain Province	Farmer[a]	Red intan	paddy	65
		Waray	paddy	60-80 depending on variety
		Balatinao	paddy	65
	MPHRFAC	Balatinao	milled, unpolished	100
		Ominio	milled, unpolished	100

Retailer	Chong-ak Unoy	milled, unpolished	100
Retailer	Red rice	milled, unpolished	100
	Black rice	milled, unpolished	120

[a] The information/price came from one farmer-respondent, hence, the price is not the average price

Heirloom rice is also traded online at prices commanded by the available online shops (Table 21). Heirloom rice is traded online through Lazada, Shopee, and Facebook.

Table 21. Heirloom rice varieties traded in online shops.

Heirloom rice variety	Link to online shop	Retail price (P/kg)	Label
Balatinaw/ Balatinao	**Shopee (Holy Crop!)** https://shopee.ph/HOLY-CROP-ORGANIC-RICE-BLACK-1-KILO-i.31724887.435933452	230	Holy Crop! Your rice and coffee store Black Rice
	Lazada https://www.lazada.com.ph/products/prime-organics-premium-black-rice-2kg-i257935641-s355408399.html?laz_trackid=2:mm_150020660_51201560_2010251560:clk5hhokh1du77a42em2gr	197.5	Prime Organics Emperor's Rice Premium Black Rice
Chong-ak Unoy	**Shopee** https://shopee.ph/Red-Heirloom-Rice-Unoy-Chong-ak-i.82197908.1461973065	230	The Filipino Store Online Unoy/Chong-ak Heirloom Rice from Kalinga
Ominio	**Shopee** https://shopee.ph/Heirloom-Rice-MOUNTAIN-VIOLET-(Sticky-Rice)-i.70745408.1181163221	160	Heirloom Rice - MOUNTAIN VIOLET (Sticky Rice)
	Bigas PH https://www.bigasph.com/collections/heirloom-organic-rice/products/mountain-violet-sticky-rice-5kg	258	Banaue Organic Purple Rice
	Ifugao Products https://www.facebook.com/commerce/products/1661380447293845/	160	MOUNTAIN VIOLET (Sticky Rice)
Minaangan	**Shopee (Holy Crop!)** https://shopee.ph/HOLY-CROP-HERILOOM-RICE-RED-1-KILO-i.31724887.435933507	330	Heirloom Rice
	Bigas PH https://www.bigasph.com/collections/heirloom-organic-rice/products/heirloom-organic-red-rice	258	Banaue Organic Red Rice
	Shopee https://shopee.ph/Heirloom-Rice-RED-RICE-(MINAANGAN)-1kg-i.70745408.1181170238	150	Heirloom Rice RED RICE (MINAANGAN)
	Lazada https://www.lazada.com.ph/products/mama-sitas-heirloom-rice-champorado-pure-tablea-cacao-rice-porridge-kit-minaangan-variety-230-g-i250461996-s341802233.html?exlaz=d_1:mm_150050845_51350205_2010350205::12:1032129542!52512091404!!!pla-293946777986!c!293946777986!341802233!144015156&gclid=CjwKCAiAx_DwBRAfEiwA3vwZYhwS0DHWBlsUS84mwLU9iaVx0Y1OdgJ5WRSnTIiAfDytUCvwEYEyBBoCPPMQAvD_BwE	195/230g	Mama Sita's Heirloom Rice Champorado Minaangan
	Ifugao Products https://www.facebook.com/commerce/products/1770379813027215/	140	RED RICE (MINAANGAN)
Tinawon (Innawi, Dona-al and Ijambulo)	**Bigas Ph** https://www.bigasph.com/collections/heirloom-organic-rice/products/tinawon-rice	258	Tinawon Organic Rice
	Ifugao Products https://www.facebook.com/commerce/products/1687097504700569/	160	Tinawon Rice

7. CONSTRAINTS, TRENDS, AND OPPORTUNITIES IN THE VALUE CHAIN DEVELOPMENT

In developing the value chain for heirloom rice, the set of actors and activities was identified to bring the heirloom rice produced in the terraces to final consumers, with each stage adding value to the heirloom rice grain. This

section discusses the challenges faced by the heirloom rice farmers, the midstream actors, and the retailers, where these constraints situate current trends and opportunities in enhancing the VCA which had been initiated in Phase I of the HRP.

7.1. Heirloom rice farmers

Farmers identified the biotic and abiotic stresses they face in heirloom rice farming. Through the FGD, they were asked to enumerate the different challenges they experienced in heirloom rice farming. Their responses were written on a flip chart placed in front of them. When they have exhausted their list of challenges, they were asked to identify from the list the most pressing challenges/issues, and they were asked to reach a group consensus. First, they were asked whether dealing with the challenges is of utmost importance and then they ranked the items on the list accordingly. Furthermore, the ranking was based on how important/challenging the issue was or how the issue highly affected their rice production. Several issues came out which can be grouped as follows: naturally occurring, agronomic constraints, economic limitations, and infrastructure and social issues.

Water and labor resource limitations, as well as the need for new equipment/machine, were the top most challenges mentioned by the participants from the FGDs (Table 22). The members of MPHRFAC and non-members of IHRPC listed insufficient supply of irrigation water as their top challenge, while in Kalinga, the members of KRTFAC mentioned incidences of drought. The members of the IHRPC experienced farm labor scarcity in their place. Ifugao is one of the most famous provinces of CAR that tourists frequent to get a view of the renowned rice terraces, which drove a large portion of the youth to be engaged as tourist guides. In Benguet, the members of BHRFAC saw the need for mechanization in their farms. They mentioned customized equipment such as a thresher/panicle thresher with a blower and said that machines to be introduced in their farm should be lightweight. They are also aware that farm equipment is expensive.

Table 22. Ranking of challenges in growing heirloom rice varieties in Cordillera.

Kalinga	Mountain Province	Ifugao		Benguet
Member of HRP-assisted Cooperatives	Member of HRP-assisted Cooperatives	Member of HRP-assisted Cooperatives	Non-member of HRP-assisted Cooperatives	Member of HRP-assisted Cooperatives
1-Drought	1-Insufficient irrigation water supply	1-Scarcity of labor	1-Insuficient water supply	1-Lack of equipment (customized thresher/panicle thresher for heirloom rice with blower, expensive farm equipment, lightweight machines)
2-Typhoon	2-Eroded rice terraces and high cost of restoration	2-Laborious and time-consuming production process compared to lowland rice production	2-Natural calamities	2-Insufficient space for drying equipment/lack of drying facility
3-Erosion	3-Extinction of heirloom rice varieties	3-Severe damages on rice terraces	3-Lack of farm machineries (e.g. threshers, customized rice mill)	3-Aging farmers
4-Earthworms	4-Low yield	4-More idle lands - converted to vegetable terraces	4-Pests and diseases such as yellowing of leaves, tungro	4-Youth do not want to do farming activities
5-Insect pest	5-Lack of pure seeds		5-Lack of labor force for land preparation to harvesting	5-Natural calamity/disaster
6-Rats	6-Long maturity, six to seven months		6-Erosion caused by giant earthworm and	

Kalinga	Mountain Province	Ifugao	Benguet
		eel (“kiwet”)	
7-Birds		7-Lack of buyers of milled rice	

The naturally occuring factors were ranked as the farmers’ second concern, highlighting conditions innate to the region. Ifugao cooperative members ranked second the drudgery and long hours (traditional methods) of doing the farm activities in the mountains, which they think make the younger generations disinterested in farming. The occurrence of natural calamities e.g., typhoon was mentioned by both non-members from Ifugao and members of the Kalinga cooperative. Members of the MPHRFAC listed the erosion of the rice terraces and the high cost of restoration while members of BHRFAC pointed out the insufficient space for the drying equipment and lack of alternative drying facilities.

The challenges ranked as third include the aging of farmers (mentioned by members of BHRFAC) and extinction of some of the heirloom rice varieities (mentioned by members of MPHRFAC). The other challenges which were already ranked as first and second are the erosion of the rice terraces and lack of machineries.

The occurrence/incidence of pests, diseases e.g., tungro (mentioned by Ifugao non-members) and earthworms (from members of the KRTFAC) were among the fourth challenges identified. Low production of heirloom rice is due to its low yield charateristics (said the members of MPHRFAC) coupled with the conversion of idle terraces to vegetable terraces (said the members of IHRPC). The members of BHRFAC declared that the youth in their locality “do not want to do farming activities”, a challenge which is closely related to scarcity of labour and the aging of farmers.

Other challenges ranked beyond rank four include pest infestations such as rats, birds, and eel. Farmers also consider as a challenge the long maturity of heirloom rice varieties, taking six to seven months, from planting to harvesting. This concern is associated with farmers’ exposure to lowland rice farming. Some farmers also shared that they are experiencing a lack of supply of pure seeds and, as mentioned by the non-members of IHRPC, the lack of buyers of milled heirloom rice.

These are the challenges faced by farmers across the four provinces which were observed to be ranked differently by each FGD group. While similar challenges were mentioned across the five FGDs, the degree or extent to which they are ranked as challenges differs by province.

7.2. Midstream actors

Processors of heirloom rice grain and products are often beset with the lack of supply of their preferred heirloom rice variety, and they associate this with low production due to the small areas planted with heirloom rice varieties and the infestation of insects, rats, and birds.

There are cooperatives that have small areas for processing or inappropriate design of the processing facility; hence, processing time would take longer. The offices of the provincial cooperatives are located away from the residences of the members. Farmers have to leave their houses very early to be able to attend meetings or participate in activities of the cooperative.

Processors of heirloom by-products are challenged by the quality of the heirloom rice grains they buy. It is common for the whole grains to be mixed with broken grains and, in worst instances, even with hulls. There are also weevils inside the sacks of rice which happens when the rice is not dried properly. Hence, there is a need to clean the rice grain further before using for processed products or before repacking.

The processor of cookies/crunch has specific concerns related to the ingredients in processing the products and the appliance they use. She complained about the increasing prices of the other ingredients and the competition

for broken grains since these are now being sold in the market or used for home consumption. The oven used for processing their products is a homemade one which lacks an efficient gadget to control temperature; hence, the baking must be highly supervised to avoid overcooked cookies.

The wine processors, likewise, experience a lack of supply of containers, bottles, or plastic gallons, especially when there are lots of orders. Most often they are asked regarding the safety issues in using plastic containers for transporting, particularly overseas.

The processor of several processed products is faced with the high price of packaging materials which are ordered in bulk e.g., 50,000 boxes per order. The business is small-scale but with varied products packed in different box sizes and shapes. She is driven to invent products and aspire to participate in exhibits, but her dilemma is the high cost of participation in exhibits.

The wine processors openly admitted that they are challenged by the lack of demand for rice wine throughout the whole year. They depend on the demand from the community and relatives or friends from abroad who have tasted the wine. The wines are usually bought in the village and the processor has not experienced delivering to shops or supermarkets in the city.

The midstream actors, particularly the processors, mentioned that they are also faced with the problem of where to market their products. The interest of the younger generation is declining not only in farming but also in the processing of heirloom rice, e.g., rice wine, the traditional way.

To improve these processed products, there is a need to link the processors to established enterprises processing the same/similar products. They can also be linked to government agencies, e.g., DTI, to look at the issues on food safety and standardization of products.

7.3. Retailers

We elicited responses from the retailers about the key challenges in buying and selling heirloom rice. The modern retailer mentioned the lack of supply and added that the suppliers are not committed to provide a stable supply of heirloom rice. She also mentioned the unpredictable number of days in waiting for the delivery of heirloom rice. Despite these experiences, she just follows the price given by the supplier. She takes pride in having quality heirloom rice now available in local markets.

The traditional retailer agreed also with the price sold to her and most often is very confident of the quality of the processed heirloom rice from the seller. However, there are times when upon closely examining the grains, she finds the rice not yet totally cleaned and not ready for selling. She still has to do some cleaning before displaying the product. The other retailers who were interviewed did not have problems regarding the price set by their supplier, but were more concerned on the delivery time and the quality of rice delivered to them.

The following table (Table 23) summarizes the challenges face by the midstream actors and the retailers.

Table 23. Summary of challenges faced by the midstream and retailers

VC actors	Challenges
Midstream actors	• lack of supply of preferred heirloom rice variety • inappropriate design of the processing facility • cooperatives are located away from the residences of the members • quality of the heirloom, whole grains mixed with broken grains and with hulls • presence of weevils in the sack of rice • competition regarding the use of broken grains • inefficient gadget to control temperature for processing cookies etc. • lack of supply of containers, e.g., bottles or plastic gallons for wine • high price of packaging materials

Retailers	• lack of demand for rice wine throughout the whole year • where to market the products • younger generations disinterest in the processing of heirloom rice, e.g., rice wine • lack of supply of heirloom rice • suppliers are not committed to provide a stable supply of heirloom rice • rice in sacks delivered are not yet totally cleaned and not ready for selling • delayed delivery time

7.4. Trends and Opportunities for Heirloom Rice

Heirloom rice varieties in CAR are considered as one of the highest quality traditional rice varieties. There are hundreds of kinds of heirloom rice in CAR and these are uniquely planted in Kalinga, Ifugao, Mountain Province, and Benguet. Heirloom rice farmers follow traditional practices and mostly use family labor to cultivate and apply organic farming by using rice straws and other debris in the area as fertilizer. As a whole, they use cultural practices from seed to seed; starting from storing the rice seeds for the next season until the rice is ready for harvest, thus, maintaining the cultural heritage of farming in CAR. Bairagi et al (2021) estimated a potential market size of heirloom rice in the Philippines of PHP 20.3 billion (USD 443 million) if farmers are able to match the product to consumer preferences. However, consumers' WTP in Metro Manila was found to average P72.61/kg (US$1.60/kg). This is less that half its current market price and explains why heirloom rice struggles to gain market share in urban markets in the Philippines. Expanding farmers' access to markets and developing the performance of heirloom rice value chains will crucially hinge on the identification of end-market opportunities.

Other traits of heirloom rice under the larger category of traditional varieties are in terms of grain quality, health benefits, nutritional value, and climate resilience[19] (HRP-IRRI 2018). Traditional varieties have a better grain quality profile, with sweet aroma and excellent palatability. Their health benefits can include low sugar content, making them a better choice for consumers who are suffering from diabetes or obesity, or those who are regulating their sugar intake. The nutritional benefits of heirloom rice include fiber, antioxidants, vitamins, and micronutrients such as iron, zinc, manganese, selenium, etc. Its resilient traits are shown by its high levels of resistance to pests and diseases and tolerance to environmental stresses such as drought, flood, and salinity.

However, the heirloom rice in CAR is known to have low yields and are late-maturing varieties, thus they can only be planted once a year. The degradation of the terraces adds to the low production of heirloom rice as some of the terraces that are not repaired are left fallow or are converted to vegetable farms.

The heirloom rice farmers opt to keep about 80% of their produce for their own consumption; hence there is a limited supply to be marketed outside CAR. Postharvest activities are manually done, mostly by the women farmers. The intermittent rain makes it difficult to dry the palay in the pavement or in a trellis, as exposure to rain can also damage the quality of the heirloom rice. These activities are very tedious and time-consuming; hence, there was an opportunity to introduce innovations for the post-production practices for heirloom rice with the HRP Phase II. The postharvest innovations are key to the quality and marketability of heirloom rice beyond CAR. They are steps towards a certification pathway that would enable heirloom rice to meet consumer demand and qualify for high-end markets and exports.

Aside from the whole grains of heirloom rice, processed products and by-products are becoming popular among consumers and other heirloom rice farmers. By-products such as the rice straw and husk/hull are used as fertilizers and material for mushroom production. The rice brewers are still fed to chickens but the broken grains are now used for home consumption as well as in processing other heirloom rice products.

Processed products such as rice cakes and rice wine are traditionally made and have a loyal local market, but these can only be purchased within the region. Processes and products are variable in quality and erratic in supply, with special variants emerging only during festivities. A more recent innovation in the last five years is the making of

[19] This is lifted from the web page HRP-IRRI 2018: http://books.irri.org/Traditional-rice-varieties.pdf

rice cookies/crunch by a local entrepeneur. These products need additional investment, systems support, channels, and strategies to be competitive and be marketed outside of the region or even outside of the country. Rice wine, in particular, has attracted the attention of companies like Destileria Limtuaco and other entrepeneurs.

These products need to pass FDA standards and other regulatory requirements but more importantly, the heirloom rice variety that would give a better taste, e.g., to the rice wine, should be identified so that the taste could be comparable with or be even better than the existing wines in the market. There is an opportunity for a marketing strategy to sustain the supply not only for occasions or festivities but for the whole year round.

Since CAR's famous rice terraces had always been a top tourist spot in the Philippines, consumers or visitors can bring home the products made in CAR and particularly from heirloom rice to serve as *pasalubong*. This presents an opportunity to improve the packaging and marketing of these products.

In Phase l of the HRP, heirloom rice had been introduced in the international and local markets. Consumers buy heirloom rice because it is known for its nutritional value. Prices of unpolished and/or milled heirloom rice vary from different channels, e.g., farmers, consolidators, retailers. The the premium price of heirloom rice will impact the lives of the farmers in the future. However, this could be hastened by the spike in online shopping which has given consumers more access to heirloom rice either as unpolished grain or other processed products. Also, with the health and travel restrictions all over the country in the middle of the COVID-19 pandemic, heirloom rice varieties are brought to the lowland markets along with the different kinds of vegetables from CAR.

Certain heirloom varieties are gradually disappearing, with some even close to extinction. The project activity on Geographical Indication or GI (a tool in protecting a specific form of intellectual property rights; Section 4 of Republic Act No. 8293) should be completed to determine and identify properly all the heirloom rice varieties in the area.

The VCA in HRP Phase II shows that the heirloom rice farmers are empowered through their cooperatives as stated in Republic Act (RA) No. 7607 known as Magna Carta of Small Farmers signed in 1992. Government programs, particularly from the DA-RFO in CAR, are coursed through the cooperatives such as the distribution of farm machinery and equipment, financial and credit assistance, and farmers' training, among others.

There are other laws that had been formulated for the protection and management of the rice farmers, heirloom rice varieties, and the terraces. The rice terraces of the Philippine Cordilleras were declared National Treasures in Presidential Decrees 260:1973 and 1505:1978. The terraces are likewise protected by RA 10066:2010 which provides for the protection and conservation of the National Cultural Heritage. RA 10068 or The Organic Agricultural Act of 2010, which seeks to boost the government's organic agriculture programs, was approved in 2010. This bill seeks to increase the income of farmers and promote food self-sufficiency. Since rice farming in the Cordillera region uses traditional methods, this law enabled two provincial cooperatives, the Mountain Province and Ifugao, to be certified as an organic agriculture body producing organic products. The Rice Tariffication Law or RA 11203:2019 provides an opportunity for farmers to earn more through exports to the world market. The law lifted the quantitative restrictions on rice exports to encourage farmers to produce much better-quality rice for export. The producers of special varieties of rice such as the heirloom, organic, and aromatic long-grain rices are encouraged to increase their export volume capacities since these kinds of rice command higher premiums, which can result in higher earnings for farmers.

8. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1. Summary

Heirloom rice varieties are high-value crops that are in demand because of the organic nature of their farming and uniquely planted on the terraces of the Cordilleras. These varieties are treated as inheritance as they are passed from one generation to the next in pure form. Over time they have acquired an inherent resistance to diseases

(bacterial blight, rice blast, and tungro) and tolerance to the environmental stresses (drought) of their ecosystem. These varieties have particular and favourable cooking qualities such as their aroma, taste, texture, color (red, purple or violet, brown, and off-white), and nutritional value.

Among the rice-producing regions of the Philippines, CAR contributes about 2% of the total national rice output and the average rice area for the heirloom rice farmers is less than 0.5 hectares. The milled heirloom rice varieties command a premium price of up to P150/kg when sold in the market. It has also been reported to be sold online for P200/kg or more.

The HRP sites in CAR include the provinces of Benguet, Ifugao, Mountain Province, and Kalinga. The VCA in Phase I generally focused on the production to marketing of heirloom rice in paddy and milled unbroken grain rice form, while the VCA in Phase II considers the other forms of processed products from heirloom rice and its by-products.

One of the impacts of the Phase I VCA is the appropriate labor valuation which led to an increase in the farm gate price of heirloom milled rice from P40–60/kg to P90/kg. During this phase, the heirloom rice varieties were introduced to chefs and they promoted heirloom rice as a main ingredient in cooking some international and local specialty dishes.

The Phase II VCA aims to assess the rice value chain in CAR with particular focus on the heirloom rice segment's additional potentials beyond whole grain use. This study used quantitative and qualitative methods involving the various actors in the value chain—farmers, midstream actors (consolidator, wholesaler, processors), retailers, and other vital players. Research activities were Activity 1—FGD with heirloom rice farmers, purposively selected; Activity 2 - individual interview with heirloom rice farmers, randomly selected; Activity 3—individual interview with midstream actors; and Activity 4—individual interview with retailers.

Farmers are one of the main actors in the value chain. They were involved in the FGDs and individual interviews conducted from July 2019 to February 2020. Majority of the FGD participants and individual interview respondents were women and most of them were at the older adulthood stage (56 years old and above). Majority are high school graduates, with about 20% having reached college. The average household size varies from 2 to 6 members. Their main source of livelihood is farming with a few engaged in non-farm work (utility man in hospital, church minister) as secondary work. In terms of classifying respondents in their use/disposal of the rice paddy harvested, most of non-members of cooperatives use it for home consumption, while cooperative members combined home consumption and sharing/selling through their cooperative.

Both men and women work on the farms but there are specific farm activities that only the men do like the more physically strenuous work, while the women do the lighter but more repetitive work. At the start of the farming season, the men are most visible or almost only the men are working in clearing and land preparation, activities that require physical strength in carrying heavy rocks/stone, moving the soil, and cutting stubborn big plants. Women come to the field at crop establishment and mostly only the women are visible in the fields during the growing season, protecting the rice plants from pest and disease infestation, maintaining water flow in the terraces, and handweeding. Both men and women join in harvesting and in postharvest activities.

The **midstream actors** are the processors of products made from heirloom rice, and may also be involved as consolidators and wholesalers through the provincial and regional cooperatives, and the self-help groups. These midstream actors are individuals or groups of farmer/s and non-farmers employed as full-time or part-time in processing heirloom rice products.

Processed heirloom products include polished and unpolished rice gains, rice flour, rice coffee, champorado mix, cereal for babies, rice wine, rice cakes (*patupat* and *nilapit/linapet*), rice cookies/bites, rice crunch, and chocovron. The rate of growth of these businesses indicates that while these are produced at small-scale, there is market potential. Additional investments, standardization of procedures, and appropriate guidance and assistance from government agency/office or business enterprises will enable them to scale up production and reach consumers outside CAR.

Case studies of processors reveal that these processors can earn up to P2,118.88 (for *patupat*) and P750 (for rice wine) per batch of products, despite the limitations of their small-scale production and the constraints of their market reach.

The trade flows of heirloom rice in the four provinces show that the provincial cooperatives (MPHRFAC, KRTFAC, and BHRFAC) act as consolidator, processor, and distributor of the heirloom rice paddy collected from the members. The provincial cooperative of Ifugao (IHRPC) is not yet fully operational, hence, the local organization and the regional cooperative (RTFC) acts as the consolidator of paddy while the Municipal Agricultural Office helps in the distribution of products through display centers.

The value chain shows the different segments of the chain, starting with input provisions and production from the farmers, and the midstream actors who do trading, processing, and wholesale, and then the retailers for the access of domestic consumers. The products that move up each step of the chain are paddy, unpolished and polished heirloom rice grains, and processed products in different forms.

With the creation/inception of the provincial cooperatives, the processed heirloom rice and products are now able to reach Philippine consumers within and outside of CAR. This is in contrast to the findings of HRP Phase I that heirloom rice had reached the international market starting in 2008, but in small volumes. The consolidator non-government organization who engaged with the farmers in CAR and developed an international market for the heirloom rice grain was able to do so with support from DA-RFO CAR, a private entrepreneur, and a regional cooperative from 2005 to 2012. However, the farmers did not benefit as much as their labor was not calculated into the price of the product.

The HRP Phase II, in partnership with DA-RFO CAR, PhilRice, and IRRI, addressed the need for a creation of a provincial cooperative to act as consolidator and processor of the paddy heirloom rice varieities. Since 2017, three of the provincial cooperatives (BHRFAC - 83 members, KRTFAC - 103 members, and MPHRFAC - 68 members) had been operational and a total of 254 heirloom rice farmers are already members as of 2020, while the IHRPC had its re-orientation in 2019.

The heirloom rice by-products include rice straw, rice hull/husk, and rice bran which are produced after rice production. After harvest, rice straw by-product is used as organic fertilizer as it is trampled into the soil. For additional source of income, it is used as mushroom bed but this does not seem to be popular among the farmers. After dehusking, the husk/hull may also be used as a medium for mushroom spawn (Figure 37) or can be converted to carbonized rice hull for mixing in seedbed soils. Rice bran is produced after polishing, but the bran in CAR is not used since only a very small amount is produced. The brewer, which are smaller in size than the broken grains, are used to feed the chickens. The rice hull/husk is valued at P10/kg. The broken grains are now used for home consumption and sold in the market for half the price of the unbroken grain for local consumers and processors of heirloom rice products.

Figure 37. Mushroom bag with rice hull/husk

The distribution of processed heirloom rice grains is through the provincial and regional cooperatives. The traders and wholesalers distribute the heirloom rice grains on a wider scale, within and outside of CAR. One of the more recently developed distribution channels of processed heirloom rice grains is the use of online selling. Transactions are conducted through the cooperatives or through middlemen. Online prices are much more variable and market presence is erratic.

Heirloom rice farmers were able to identify the various heirloom rice varieties in their province and were able to distinguish the premium, good, and low-quality varieties. However, they claim that there is no poor-quality heirloom rice but only improper postharvest handling of the rice. Varieties used most for home consumption or for selling were also identified, namely Chong-ak, Ulikan, Waray, Minaangan, Balatinao, and Madduli.

Retailers described the quality attributes of heirloom rice as follows: no broken grains, uniform sizes, soft when cooked, and physical appearance and characteristics do not change with prolonged storage. Quality also includes proper packaging, with the cost of packaging material including the label for a one-kilo heirloom rice adding P10 to the selling price.

The prices of heirloom rice vary by variety and by form (paddy or milled/semi-polished). From the various value chain actors—from farmer to provincial cooperative and then to retailer—prices increase from P60 to P140 to P150, respectively, particularly for Chong-ak in Kalinga.

The challenges experienced by the heirloom farmers in growing rice include environmental stresses (drought, insufficient water, erosion), labor scarcity (aging farmers as the younger generation does not want to go into farming), low yield, seed quality, inadequate machines, facilities and equipment (customized thresher/panicle thresher for heirloom rice with blower, customized thresher/mill, drying facility, etc.), natural calamities, pest infestation (earthworm, insect, eel, rats, bird), plant disease (tungro), and economic issues (land conversion).

The processors of heirloom rice grain and products are often beset with the lack of supply of their preferred heirloom rice varieties. These contribute to low production, together with other issues such as small land area for planting and the infestation of insects/rats and birds.

The challenges met by the midstream actors include: small processing facility, cooperatives are located far from the farmers' residences, unclean and not pure rice in low quality packaging, limited markets for the products, and high cost/lack of packaging materials and containers.

For the retailers, their key challenges in buying and selling heirloom rice are lack of supply, unclean processed rice in poor packaging, and suppliers are not fully committed to supply heirloom rice.

8.2. Conclusions and Recommendations

With the cooperatives, the value chain of heirloom rice has acquired some stability, as a small but fairly regular supply of heirloom rice now reaches the domestic market. This has also helped the producers of products of heirloom rice as their raw materials can be more reliably sourced. Most producers of heirloom rice products are small-scale entrepreneurs that have been making and selling their rice cake and rice wine using traditional knowledge and technology. The limited scale at which they produce also limits their market and potential profit.

The example of a relatively new producer who has innovated in producing more contemporary products such as cookies, crunch, and chocovron from heirloom rice illustrates other potentials for heirloom rice outside of the unbroken grain and traditional products. But her market is limited to the region and her products have yet to be officially registered.

The by-products of heirloom rice are currently underutilized. The rice straw is trampled into the soil for its perceived fertilizing benefit, despite its potential as a medium for mushroom growing. The rice hull has been demonstrated to be useful not just as a medium for mushroom growing but also for soil enrichment once carbonized. However, only a few farmers are utilizing this resource. Likewise, the rice bran, the most nutritious part of the rice grain, is not used as only a small amount is produced, most likely because there is no systematic way of collecting them during the milling process. Only the brewer and the broken grains are utilized, but the former is given to chickens, which is a loss of precious components of this high-value rice.

Farmers stand to gain more with the full utilization of every heirloom rice grain they produce. While the by-products could be put to better use, it is in the food and beverage products that higher incomes can be realized, capitalizing on the health and nutritional values that can be derived from heirloom rice. Potentials for rice bran as nutrient supplement and as a source of oil exist, as evidenced by markets for these products among our Southeast and South Asian neighbors. Food technology research and standardization are needed for products such as rice

cakes and rice wines to have better quality and longer shelf life. Technical assistance and technology investments are needed to provide training and equipment to scale up products such as the rice cookies and crunch and other rice flour-based foods. All these products need to meet certification standards for them to reach markets beyond CAR. Consumer demand can be enhanced through better packaging and innovative marketing approaches. These products need additional investment and systems support, as well as promotional strategies to be competitive and marketed outside of the region or even outside of the country.

Finally, a market study in Metro Manila conducted under HRP I and II has showed that urban consumers' willingness to pay for heirloom rice is currently lower than the prices farmers need to receive in order to get decent return to their labor costs (Bairagi et al 2021). Therefore, the authors propose several policy options. First, policy makers and value chain actors are advised to invest in information campaigns to educate consumers about the social, cultural, environmental, and nutritional value of heirloom rice in the Philippines. This is motivated by the fact that they found that urban consumers were unaware of the values of heirloom rice varieties grown in the Cordillera region. Secondly, the authors propose a two-tier marketing strategy focusing on (i) retaining the market segments that are currently paying price premiums for heirloom rice; and (ii) expanding market share to other market segments, such as premium white rice consumers. Cuevas et al. (2018) demonstrated through behavioural experiments that premium white rice consumers can be convinced to switch to heirloom rice if they are informed about the role they can play in preserving cultural heritage. Bairagi et al (2021) conclude that "In both cases (e.g., retention and expansion), the product's distribution channels should be carefully considered. For the existing market segment, for instance, the promising channels of heirloom rice may include high-end retail outlets (e.g., for the upper-income group), convenient retail stores (e.g., for the professionals), and institutional establishments (e.g., for out-of-home consumption of single professionals). A different distribution strategy can be further explored to expand market share to other segments. For instance, mid-range retail outlets may be more visited by the broader middle class. Hence, including heirloom rice in the store's product portfolio may potentially attract trial purchases from premium white-rice consumers." Thirdly, added value can be created by branding the cultural and social value and value of sustainability of heirloom rice through terms such as "heirloom", "heritage", "organic", and "fair trade" (Glover and Stone 2018). Finally, marketeers should position heirloom rice in the Filipino "gastronomic system" to enhance its suitability within rice-based diets (Cuevas et al. 2017) and position the product relative to its substitutes (e.g., brown rice, organic rice, and other pigmented rice). Celebrity chefs could play a major role endorsing heirloom rice and increasing its suitability in Filipino diets. Hence, valorization of heirloom rice will require substantial government intervention in the demand side and in the supply side, e.g., by encouraging crowding-in of private sector investment in advertising, branding, and upgrading of heirloom rice value chains.

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Appendix table 1. Volume of palay, area planted and yield by ecosystem and by province, Philippines and Cordillera Administrative Region (CAR), 2014-2019

Volume of palay production (metric tons) by ecosystem and by province, Philippines and Cordillera Administrative Region (CAR), 2014-2019

	2014	2015	2016	2017	2018	2019
Total Palay						
PHILIPPINES	18,967,826	18,149,838	17,627,245	19,276,347	19,066,094	18,814,827
CAR	452,609	400,911	382,848	445,006	391,105	418,321
Abra	75,500	66,716	65,159	69,477	62,120	82,430
Apayao	101,158	96,453	86,430	103,335	76,346	86,819
Benguet	17,355	18,144	18,145	20,276	19,918	20,448
Ifugao	63,076	63,362	60,866	62,387	60,077	53,940
Kalinga	176,529	141,094	137,784	173,292	156,269	158,285
Mountain Province	18,991	15,142	14,464	16,239	16,376	16,400
Irrigated Palay						
PHILIPPINES	14,405,716	13,937,924	13,539,873	14,557,319	14,347,993	14,468,945
CAR	389,732	345,847	334,494	389,558	349,285	363,372
Abra	52,363	47,320	44,332	48,119	42,945	57,228
Apayao	72,925	71,204	68,741	81,192	62,938	69,004
Benguet	15,201	15,905	15,588	17,816	17,590	18,078
Ifugao	61,263	61,551	59,102	60,591	58,384	52,000
Kalinga	171,213	136,463	133,565	167,849	153,133	153,100
Mountain Province	16,767	13,404	13,166	13,991	14,296	13,962
Rainfed Palay						
PHILIPPINES	4,562,110	4,211,913	4,087,371	4,719,028	4,718,101	4,345,883
CAR	62,877	55,064	48,354	55,448	41,820	54,948
Abra	23,137	19,396	20,827	21,358	19,175	25,202
Apayao	28,233	25,249	17,689	22,143	13,408	17,814
Benguet	2,154	2,239	2,557	2,460	2,328	2,370
Ifugao	1,813	1,811	1,764	1,796	1,693	1,939
Kalinga	5,316	4,631	4,219	5,443	3,136	5,185
Mountain Province	2,224	1,738	1,298	2,248	2,080	2,438

Palay: Area harvested by ecosystem and by province, Philippines and Cordillera Administrative Region (CAR), 2014-2019

	2014	2015	2016	2017	2018	2019
Total Palay						
PHILIPPINES	4,739,672	4,656,227	4,556,043	4,811,808	4,800,406	4,651,490
CAR	118,476	111,482	110,640	115,555	111,387	110,763
Abra	24,056	23,987	23,993	24,014	23,541	23,542
Apayao	27,566	27,552	24,950	26,245	23,312	24,398
Benguet	6,286	6,284	6,564	6,976	7,098	7,124
Ifugao	17,259	17,259	17,253	17,248	17,220	16,099
Kalinga	37,041	31,424	33,059	35,913	35,062	34,579
Mountain Province	6,268	4,976	4,821	5,159	5,154	5,021
Irrigated Palay						
PHILIPPINES	3,253,080	3,233,186	3,181,102	3,295,086	3,286,153	3,262,486
CAR	93,301	86,521	88,006	92,205	90,420	90,312
Abra	14,950	14,927	14,919	14,934	14,480	14,549
Apayao	16,267	16,270	15,968	16,877	15,933	17,522
Benguet	5,200	5,200	5,276	5,755	5,877	5,903
Ifugao	16,399	16,399	16,393	16,388	16,382	15,582
Kalinga	35,098	29,485	31,244	34,011	33,515	32,656
Mountain Province	5,387	4,240	4,206	4,240	4,233	4,100
Rainfed Palay						
PHILIPPINES	1,486,592	1,423,041	1,374,940	1,516,722	1,514,253	1,389,004
CAR	25,175	24,961	22,634	23,350	20,967	20,451
Abra	9,106	9,060	9,074	9,080	9,061	8,993
Apayao	11,299	11,282	8,982	9,368	7,379	6,876
Benguet	1,086	1,084	1,288	1,221	1,221	1,221
Ifugao	860	860	860	860	838	517
Kalinga	1,943	1,939	1,815	1,902	1,547	1,923
Mountain Province	881	736	615	919	921	921

Palay: Yield per hectare by ecosystem and by province, Philippines and Cordillera Administrative Region (CAR), 2014-2019

	2014	2015	2016	2017	2018	2019
Total Palay						
PHILIPPINES	4.00	3.90	3.87	4.01	3.97	4.04
CAR	3.82	3.60	3.46	3.85	3.51	3.78
Abra	3.14	2.78	2.72	2.89	2.64	3.50
Apayao	3.67	3.50	3.46	3.94	3.27	3.56
Benguet	2.76	2.89	2.76	2.91	2.81	2.87
Ifugao	3.65	3.67	3.53	3.62	3.49	3.35
Kalinga	4.77	4.49	4.17	4.83	4.46	4.58
Mountain Province	3.03	3.04	3.00	3.15	3.18	3.27
Irrigated Palay						
PHILIPPINES	4.43	4.31	4.26	4.42	4.37	4.43
CAR	4.18	4.00	3.80	4.22	3.86	4.02
Abra	3.50	3.17	2.97	3.22	2.97	3.93
Apayao	4.48	4.38	4.30	4.81	3.95	3.94
Benguet	2.92	3.06	2.95	3.10	2.99	3.06

	2014	2015	2016	2017	2018	2019
Ifugao	3.74	3.75	3.61	3.70	3.56	3.34
Kalinga	4.88	4.63	4.27	4.94	4.57	4.69
Mountain Province	3.11	3.16	3.13	3.30	3.38	3.41
Rainfed Palay						
PHILIPPINES	3.07	2.96	2.97	3.11	3.12	3.13
CAR	2.50	2.21	2.14	2.37	1.99	2.69
Abra	2.54	2.14	2.30	2.35	2.12	2.80
Apayao	2.50	2.24	1.97	2.36	1.82	2.59
Benguet	1.98	2.07	1.99	2.01	1.91	1.94
Ifugao	2.11	2.11	2.05	2.09	2.02	3.75
Kalinga	2.74	2.39	2.32	2.86	2.03	2.70
Mountain Province	2.52	2.36	2.11	2.45	2.26	2.65

Latest update:20200117 09:00 Source: Philippine Statistics Authority (PSA)

Appendix table 2. Number of FGD participants by province and membership in the cooperative.

Province	Municipality	MHRPa	NMHRPb	Total
Kalinga	Pasil & Lubuagan	8	7	15
Ifugao	Kiangan, Hungduan, & Lagawe	3	9	12
Mountain Province	Barlig, Bauko, & Tadian	8	-	8
Benguet	Kibungan, & Bakun	8	-	8
TOTAL		27	16	43

[a]MHRP - Member of HRP-assisted coop [b]NMHRP - Non-member of HRP-assisted coop

Appendix table 3. Distribution of the respondents of the individual interview by place of residence.

Province	Municipality (No. of respondents)	Village (No. of respondents)	MHRP[a]	NMHRP[b]	Number of respondents
Kalinga			36	17	53
	Lubuagan (6)	Upper Uma (2)			
		Lower Uma (4)			
	Pasil (47)	Balatoc (47)			
Ifugao			10	13	23
	Hungduan (13)	Hapao (10)			
		Poblacion (2)			
		Nangulunan (1)			
	Kiangan (7)	Julongan (7)			
	Asipulo (2)	Andumtod (2)			
	Hingyon (1)	Anao (1)			
Mountain province			[c]	1	1
	Tadian (1)	Sumadel (1)			
Benguet			-	-	
TOTAL			46	31	77

[a]MHRP - Member of HRP-assisted coop [b]NMHRP - Non-member of HRP-assisted coop

[c]Farmers' consent form is pending

Appendix table 4. Number of midstream actors and retailers interviewed by province.

Province	Minicipality	Number of midstream actors	Number of retailers
Kalinga	Tabuk City	1	1
Ifugao	Banaue	1	-
	Lagawe	1	
	Asipulo	1	
Mountain Province	Sagada	1	2
	Besao	1	
	Bauko	2	
Benguet		-	-
TOTAL		8	3

Appendix table 5. Number of producers, midstream actors, and retailers interviewed and met in gathering information from August 2019 to February 2020.

Province	**Activity 1:** FGD		**Activity 2:** Individual interview		**Activity 3:** Midstream actor	**Activity 4:** Retailer
	MHRP	NMHRP	MHRP	NMHRP		
Kalinga	8	7	36	17	1	1
Ifugao	3	9	10	13	4	2
Mountain Province	8	-	-	1	3	
Benguet	8	-	-	-	-	-
TOTAL	27	16	46	31	8	3

Annex 1. Participation information sheet, VCA-HRP Phase 2, 2019

PARTICIPANT INFORMATION SHEET
Inpormasyon Para ti Agpartisipar

Research Title: Value Chain Analysis of Heirloom Rice in the Cordillera Administrative Region
Ulo ti Panagsukisok: Panangalisar ti Pateg Dagiti Nadumaduma nga Aktibidad No Nalpasen ti Produksyon ti Naipatawid a Mula a Bagas idiay Cordillera Administrative Region
Research Institution: International Rice Research Institute

Dear Respondent, Patpatgenmi a Makipartisipar Daytoy a Panagsukisok,

You are invited to take part in a study about the Value Chain Analysis of Heirloom Rice in the Cordillera Administrative Region. In this study, we will be conducting focus group discussion (FGD) and in-depth interviews with farmers and other value chain actors involved in the production, trading, processing, wholesaling, and selling of heirloom rice, its processed products and by-products. The details of the study are described below:

Awisen dakayo a makipag-gamulo iti daytoy a panagsukisok maipanggep ti Panangalisar ti Pateg Dagiti Nadumaduma nga Aktibidad No Nalpasen ti Produksyon ti Naipatawid a Mula a Bagas iti Cordillera Administrative Region. Iti daytoy a panagsukisok, angayenmi ti pannakisarita babaen ti *focus group discussion* (FGD) ken naun-uneg nga interbyu iti grupo dagiti mannalon ken dadduma pay nga adda pannakainaig na iti produksyon, panagnegosyo, panagproceso, panagpakyaw, ken panaglako iti naipatawid a gameng kas iti mula a bagas, kasta met ti naproceso a produkto ken dadduma pay a mapataud a produkto na. Dagiti detalye maibinsa-binsa iti baba.

What is the research study about? Ania ti kaipapanan ti panagsukisok?
The Market Rapid Assessment aims to assess the rice value chain in the Cordillera Administrative Region with particular focus on the heirloom rice segment. The study primarily aims to identify the constraints and opportunities within the value chain to improve the production and marketability of heirloom rice, both in the domestic and potential export markets.
Ti Alisto a Panagbaluar ti Mercado (*Market Rapid Assessment*) panggepna ti mangkilatis ti pateg dagiti nadumaduma nga aktibidad no nalpasen ti produksyon ti bagas iti Cordillera Administrative Region kangrunaanna iti sector ti naipatawid a mula a bagas. Kangrunaan a gagem ti panagsukisok maitudo no ania dagiti tubeng ken oportunidad no nalpasen ti produksyon ti bagas. Masapul a maitudo dagitoy tapno mapaadu ti produksyon ken mapapintas ti wagas ti panaglako daytoy naipatawid a bagas, iti mercado man wenno iti possible a pannakailako na iti sabsabali a pagilian.

Who is undertaking the research study? Asino ti mangiwayat daytoy a panagsukisok?
The interviews will be mainly conducted by the research team from the International Rice Research Institute (IRRI) led by Ms. Phoebe Ricarte, Ms. Joyce Luis, and staff from the Department of Agriculture—Cordillera Administrative Region.
Ti grupo dagiti agsuksukisok manipud iti International Rice Research Institute (IRRI) nga idauluan da Ms. Phoebe Ricarte, Ms. Joyce Luis, ken staff ti Department of Agriculture–Cordillera Administrative Region ti mangiwayat ti interbyu kadagiti maseknan nga agpartisipar iti daytoy a panagsukisok.

Why am I being invited to participate? Apay a naawisak nga agpartisipar?
You have been selected as one of the value chain actors in the heirloom rice segment and we wish to ask for your opinion on the subject area.
Napili da ka a pagsaludsodan gapu ta maysa ka nga adda pannakainaiganna iti sector ti naipatawid a panagmula ti bagas. No mabalin kayatmi a maammuan ti kapanunotam maipanggep daytoy a banag.

What will I be asked to do? Ania a banag dagiti mapagsaludsodan kaniak?
We would like to ask for your time for approximately 1 to 1.5 hours to answer a few questions and openly discuss some areas of your production/operations practices and decisions. We have prepared a question guide to facilitate our discussion.
Kayatmi la koma a makibingay tay oras mo agarup maysa inggana maysa ket gudua nga oras ta sungbatam dagiti saludsodmi ken umannugotka a pagsasaritaan tayo ti sumagmamano a banag iti benneg ti produksyon/operasyon, kannawidan ken dagiti desisyon. Adda insaganami a panangiturong ti saludsod tapno naan-annayas ti panagsasarita tayo.

(For FGDs) You will be given a break and some light snacks during or after the FGD. We really appreciate if you can arrive on time at the session venue, preferably 30 minutes before the session starts.
(Para iti FGDs) Kalpasan ti panagsasarita, maikkan kayonto ti gundaway a sumango ti personal a kasapulan sakbay a mapan tayo tay makunkuna *a focus group discussion*. Maiserbinto ti nanumo a meryenda sakbay wenno kalpasan ti FGD. Pagyamanan minto unay no makasangpet kayo iti umno nga oras iti lugar a pagsasaritaan, a no mabalbalin 30 minutos sakbay mangrugi ti sesyon.
(For in-depth interviews) If in case you want to do the interview on another time, please let the enumerator know. We will be happy to arrange for a follow up visit to complete the interview.
(*Para iti naun-uneg wenno naan-anay nga interbyu*) No kas pagarigan ta kayatyo a maangay tay interbyu iti nawaya nga oras yo, pagyamananmi no pakaammuanyo tay enumerator. Pakaragsakanmi ti mangurnos iti sumaruno a panagbisita mi tapno makumpleto ti interbyu

Are there any risks associated with participating in survey? Addanto ngata tumpuar a dadagsen iti panagpartisipar ko iti survey?
The most likely burden of participation to the survey includes giving up at least 2 hours. To minimize the possible burden, we will provide light snacks and a small token of appreciation.
Ti ngata lang makita a dadagsen iti panagpartisipar iti survey isu tay pannakataktak mo iti dua nga oras. Tapnon saankanto unay a madadagsenan, addanto iserbimi a nanumo a meryenda ken sangkabassit a regalo kas panagyamanmi ti itedyo a gundaway a makasarsarita dakayo.
You may also experience tiredness throughout the FGD/interview. To ease the discomfort and/or tiredness, we can take a short break. Just let the enumerator know if you feel tired.
Ammomi nga addanto mariknayo a pannakabannog iti unos ti FGD ken interbyu. Tapnon maalay-ayan ti pannakabagot wenno pannakabannogyo, maaddaan kayonto ti gundaway nga ag-relaks. Ibagayo lang iti enumerator no mariknayonto man ti pannakabannog.

What are the benefits of the research study? Ania dagiti benepisyo daytoy a panagsukisok?
The study will provide insights on the constraints and opportunities for the heirloom rice segment. This study will validate the information gathered during the Phase 1 of the Heirloom Rice Project and elicit information on the value chain of processed products and by-products derived from heirloom rice. The emerging market opportunities and share of benefits from heirloom rice can be transferred to farmers by introducing value chain upgrading strategies which will help guide policy makers prioritize their investments to improve the heirloom rice value chain.

Daytoy a panagsukisok ipaayna ti naan-anay a panangawat wenno panangammo kadagiti tubeng ken oportunidad iti sector ti naipatawid a panagmula ti bagas. Paneknekanna wenno certipikaranna dagiti inpormasyon a naurnong iti Umuna a Bansada ti Proyekto iti Naipatawid a Panagmula iti Bagas, ken mangadaw ti inpormasyon manipud iti pateg dagiti nadumaduma nga aktibidad no nalpasen ti produksyon ti bagas idiay Cordillera Administrative Region kangrunaanna iti sector ti naipatawid a mula a bagas. Dagiti tumpuar nga opurtunidad iti mercado ken benepisyo manipud iti naipatawid a panagmula ti bagas, mabalin a maiyallatiw kadagiti mannalon babaen ti panangiyammo iti pannakaital-o ti stratehiya no nalpasen ti produksyon. Babaen daytoy a wagas, maiturong dagiti agpanpanday ti polisiya a mangisayangkat ti umno a prioridad ti pagpuonan tapno mapapintas ti pateg dagiti nadumaduma nga aktibidad no nalpasen ti produksyon ti naipatawid a panagmula ti bagas.

Can I withdraw from the FGD/interview? Mabalin nga agikkatak iti FGD/interbyu?
Participation in this is completely voluntary. If you agree to participate, you can withdraw from the interview at any time. Your decision will not affect your relationship with the Heirloom Rice Project partners including your cooperative, DA-CAR, or PhilRice, or IRRI.
Naan-anay a boluntaryo ti partisipasyon iti daytoy. No umanamongka nga agpartisipar, mabalinmo met latta ti agikkat weno pumanaw iti uray ania nga oras. Tay desisyon mo saan nanto nga apektaran tay relasyon mo iti *Heirloom Rice Project* ken kadagiti kakaduana agraman tay kooperatiba a nakaikappengam, DA-CAR man, wenno PhilRice, wenno IRRI.

What will happen to my information? Anianto pagbanagan dagiti inpormasyon nga inburayko?
This research is compliant with the Data Privacy Act of 2012 of of the Philippines. The information you provide and the raw data will be confidentially stored in IRRI on a password protected electronic database for a period of **ten years** and will only be accessible to the core research team. The dataset will also be made available in the future to other researchers including IRRI but rest assured that you will not be identified and your personal data will not be divulged. The information will be analyzed and only the result summaries will be used for journal articles, and conference presentations.
Daytoy a panagsukisok, agtulnog iti *Data Privacy Act of 2012 of the Philippines*. Amin nga inpormasyon nga inburaymo ken dagiti saan pay naarisit a dokumento maidulinda iti *password- protected electronic database* ti IRRI iti unos ti sangapulo (10) a tawen ken dagiti laeng kangrunaan a miembro ti grupo ti panagsukisok ti addaan iti karbengan a mangkita. Mabalin to met a maipakita dagiti inpormasyon kadagiti agsuksukisok agraman ti IRRI iti masanguanan a panawen ken ipanamnamami saanto a maammuan ti kinasiasinom ken saanto met a maiburay dagitay personal data yo. Maanalisarto dagiti inpormasyon ken dagitinto laeng pakabuklanna ti mausar iti journal, artikulo, ken presentasyon iti kumperensya.

You have rights as a data subject, including the right to object, to access, and to correction of your personal information. Your personal information is protected under the applicable Philippine laws, including, but not limited to, the Data Privacy Act of 2012. Your personal data will be kept confidential and be protected by the International Rice Research Institute through appropriate security measures for data protection. For any misuse of the information you will provide, your complaints will be addressed by IRRI c/o the Principal Investigator of the research study.
Adda karbengam kas nagpartisipar ti pannakaummong ti inpormasyon agraman tay karbengam a saan a mangipalubos. Kasta met a karbengam pay a mangkita ken mangisimpa tay personal nga inpormasyon mo. Tay personal nga inpormasyon mo masalakniban babaen kadagiti paglintegan ti Pilipinas, agraman ngem saan laeng a pakaseknan, iti *Data Privacy Act of 2012.* Dagitay inpormasyon maipanggep iti personal a kabibiangmo kunpidesyal a maidulinda ken salakniban pay ti International Rice Research Institute babaen ti naan-anay nga addang a pangsalaknib kadagiti inpormasyon. No adda di umno a pannakausar ti inpormasyon nga inburaymo, tay panagririm wenno panagprotesta, ti IRRI ti mangsungbat ken maidalan iti Principal Investigator ti panagsukisok.

Who do I contact if I have questions about the study? Asino ti kontaken no adda saludsodko maipanggep ti adal a panagsukisok?
Phoebe Ricarte; Mobile: +639168711011; Email: p.ricarte@irri.org

What if I have a complaint or any concerns? Kasano no adda reklamok wenno banag a pakaseknak?
If you have questions or problems associated with the practical aspects of your participation in the discussions, or wish to raise a concern or complaint, then you should consult the Principal Investigator. Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome. The Principal Investigator is Dr. Cecilia Acuin and may be contacted on the following details:
No adda man saludsod mo wenno problema mainaig iti naiyaplikar nga aspeto ti panagpartisipar mo iti napagsasaritaan, wenno adda kayat mo nga ikamang a reklamo, kunsultaenyo laeng ti Principal Imvestigator. Ania man a reklamo wenno problema, kunpidensyal a matratar ken naan-anay a maimbestiga. Mapakaammuan kayo no ania man ti banag ti imbestigasyon. Ni Dr. Cecilia Acuin ti Principal Investigator. Makontak yo isuna kadagiti sumaganad a detalye:

Phone: +6325805600 ext. 2507; Mobile: +639178074950; Email: c.acuin@irri.org

Yours sincerely,

Dr. Cecilia Acuin
IRRI, Philippines
Senior Scientist, Human Nutrition
International Rice Research Institute (IRRI), Los Baños, Philippines
Phone: +6325805600 ext. 2507
Mobile: +639178074950
Email: c.acuin@irri.org

Annex 2. Information consent form, VCA-HRP Phase 2, 2019

--- INFORMED CONSENT FORM ---

1. I have read and understood the attached Participant Information Sheet;
   Nabasak ken naawatak datoy nakasilpo nga Participation Information Sheet
2. I have been given the opportunity to ask questions and have had them answered to my satisfaction.
   Inikkan dak ti oportinidad nga agsaludsod ken masiyaatan nak dyai sungbat da.
3. I agree to take part in this project;
   Kumanunongak nga maki parte id toy nga adal
4. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason;

Maawatak nga ti partisipasyon ko ket sipupuso, saan nak nga napilit, ken mabalinak nga umikkat ana man ti oras nga awan ti itig ko nga rason

5. I have been informed that, while information gained during the study may be published and the data set made available to other researchers, I will not be identified and my personal results will not be divulged. I have been informed that the personal private information and raw data gained during the study will be confidentially stored in IRRI on a password protected electronic database for a period of **ten years.**
   Nabagaanak nga uray dagiti impormasyon ti adal ket isurat ken dataset ket mabalin usarin ti sabali, haan da maammuan siyak ken ti impormasyon ti bagig. Nabagaannak nga ti impormasyon ti bagig ken raw data ket idulin dyia IRRI nga naprotektohan ti password anggana sangapulo nga tawin.
6. I have been informed of my rights as a data subject, including the right to object, to access, and to correction of my personal information. My personal information is protected under the applicable Philippine laws, including, but not limited to, the Data Privacy Act of 2012 of the Philippines. Hence, I understand that all personal data I provide will be kept confidential and be protected by the International Rice Research Institute through appropriate security measures for data protection. For any misuse of the information I provided, my complaints will be addressed by IRRI c/o Principal Investigator of the research study.
   Nabagaanak ti pudnok gamen syak ti naggappuan ti datus, iraman ti pudno nga sumupyat (object), usarin, ken pangaturan (correction) ti impormasyon ti bagim. Ti impormasyon ti bagim ket nasalakniban (protected) ti mabalbalin nga regulasyon ti Pilipinas, nairaman ngem saan nga limitado, the Data Privacy Act of 2012 ti Pilipinas. Tay impormasyon ti bagim ket idulin nga awan ti makaammo, ken proteckdato ti IRRI nga adda ti maibagay (suitable/appropriate) nga sekuridad ti pag proteksyun ti datus. No annya man ti madi nga pinagusaran ti impormasyon mo, didjay reklamong ket sumbatan ti IRRI, Principal Investigator ti adal.
7. I hereby consent to the use of my personal photographs by the IRRI team, for all purposes of education, instruction, or public information, without the use of my name in any medium, including by publication, display, the Internet or in promotional material. I understand that I retain no rights in the material and that it may be reproduced by IRRI and others, without further permission. This includes allowing IRRI to provide the material to reporters who are covering food-related and value chain-related news. I release IRRI and others from any claims arising out of such uses.
   Syakon ket mak i-anamongan ti pinagusar ti personal konga lettrato nga ala ti IRRI team, para ti gandat (purpose) ti edukasyon, pagsuro, wen no public impormasyon, nga haan nga ususarin ti nagan ko, kadua ti publication, pakaammo (display), idjay Internet wen no promosyunal nga kasapulan (material). Maawatak nga awan kanyak tay pudno djay kasapulan ken mabalin nga usarin ti IRRI ken sabali pay, uray wan ti permisso. Kadua ditoy baybayan ti IRRI nga mangitid ti inpormasyon djay reporter panggit ti makmakan ken VC nga balita. Ipaubayak ken IRRI ken sabali pay nu anna man ti mapahamak gamen ti sabali nga usar na.
8. I am aware that I should keep a copy of this Consent Form, when completed.
   Ammok nga idulin ti kopya datoy Consent Form, nu malpasen.

Informed Consent for a participant who is literate:
Informed consent para ti participant nga naka adal

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction.
Nabasak dagiti impormasyon wen no adda ti nagbasa para kanyak. Adda ti oportunidad ko nga nagdamag pangget dayta ken amamin nga saludsudek ken nasungbatan da nga nalaing/pannakapnek (satisfaction).
I am aware that I can address any concern or complaint to the Principal Investigator on the following contact details:
Ammok nga mabalin ko nga ibaga ti pasdek (concern) o reklamo indjay Principal Investigator ditoy detayle ti contact na.
Dr. Cecilia Acuin
Phone: +6325805600 ext. 2507; Mobile: +639178074950; Email: c.acuin@irri.org

I consent voluntarily to participate in this research.
Siyak ket buluntaryo nag makitipon di toy nga pagadadalan

Print Name of Respondents: _____
Isurat ti nagan usar ket dakkil nga lettra
Signature of Respondent: _____
Pirma

Date:_____ (Day/month/year)
Petsa

Informed Consent for a participant who is illiterate:
Inpormed consent para ti awan ti adal na nga makitipon

Illiterate participants must include their thumb-print and a literate witness must sign (if possible, this person should be selected by the participant and have no connection to the research team).
Ti makitipon nga awan ti adal na, kasapulan ti marka ti tangan nyo ken maysa nga kadua nga adda adal na nga ag pirma met (nu mabalbalin, datoy nga tao ke pinili tay makitipon ken awan ti ammo na kadagiti research team)

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.
Nasaksianak ti husto nga pagbasa tay consent form djay mabalbalin nga makitipon, ken isuna ket adda aportunidad nga agsaludsod.

Pakeknekak (confirm) nga isuna ket naikkan ti consent nga awan ti bayad na.
Print name of witness:_____
Printa ti nagan ti saksi
Thumb print of participant
Tangan ti makitipon
Signature of witness: _____
Pirma ti sabainga tao
Petsa Date:_____
Day/month/year
Aldaw/Bulan/Tawin

Annex 3. Heirloom Rice Trade Flows for the four provinces and Cordillera Administrative Region

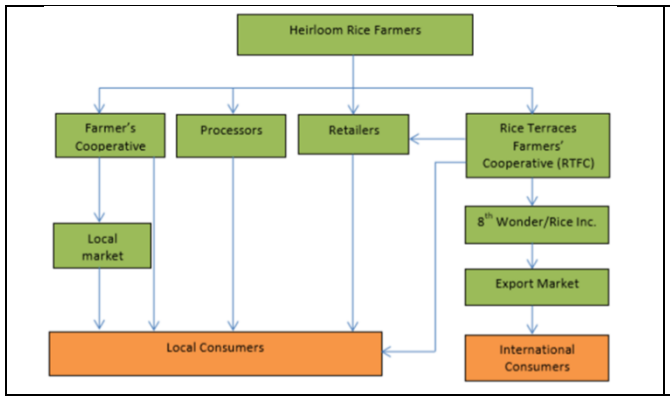


Figure _. Trade flow of heirloom rice in Mountain Province

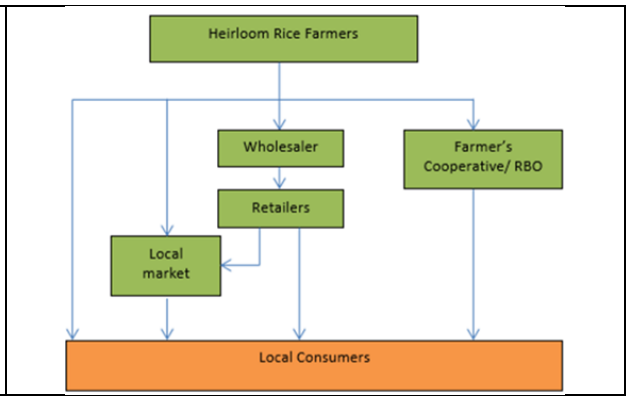


Figure _. Trade flow of heirloom rice in Benguet

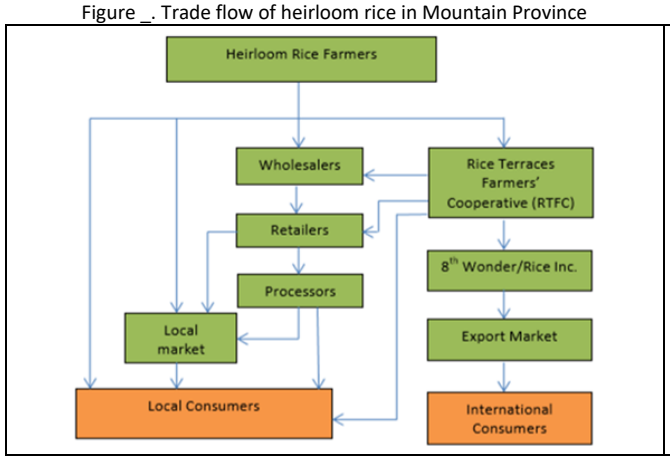


Figure _. Trade flow of heirloom rice in Kalinga

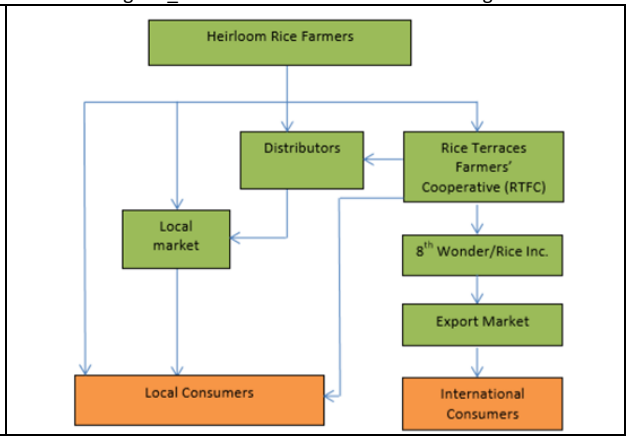
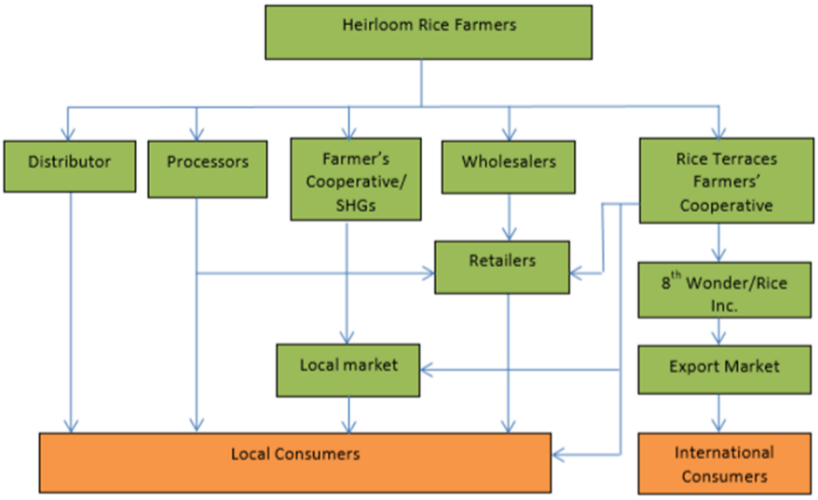


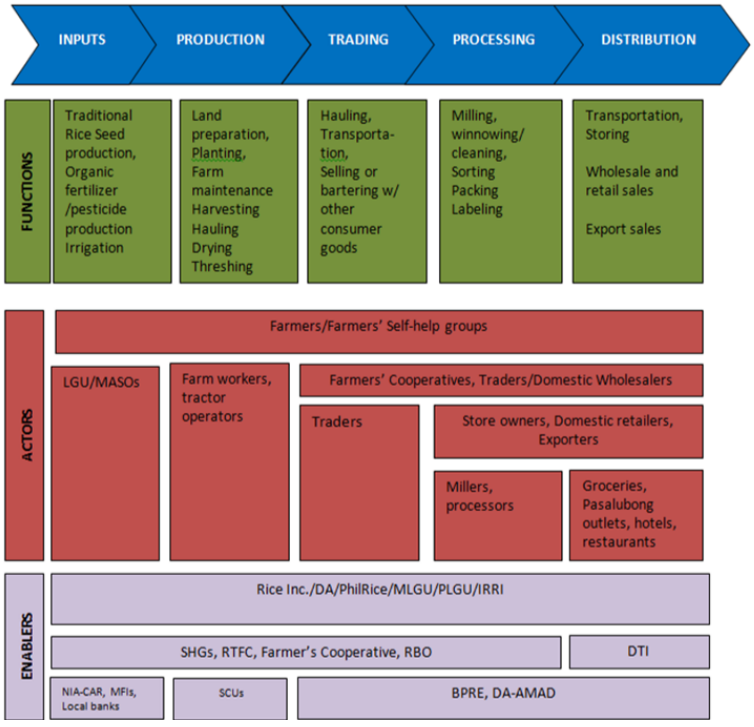
Figure _. Trade flow of heirloom rice in Ifugao



Trade flow of the four provinces in CAR

Source: _____. 2016. Value Chain Analysis of Heirloom Rice in the Cordillera Administrative Region. Project report for the project entitled Raising productivity and enriching the legacy of heirloom or traditional rice by empowering communities in unfavorable ricebased ecosystems Heirloom Rice Project (HR).

Annex 4. Value chain map of heirloom rice industry in CAR



Source: HRP Phase1 and PRDP reports

HEIRLOOM RICE PROJECT
Capturing Value Preserving Heritage

DEPARTMENT OF AGRICULTURE
1898

Department of Agriculture
Philippine Rice Research Institute
Central Experiment Station
Maligaya, Science City of Muñoz, 3119 Nueva Ecija

IRRI