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Agricultural Changes in the Rice Terraces of the Cordillera Region, Northern Philippines and their Impacts on Labor Dynamics and Food Security

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Abstract- The study covered four rice terraces clusters in the Cordillera region, Northern Philippines located in Asipulo, Ifugao, Tanglagan, Apayao Province, Bagumbayan, Tabuk City, Kalinga and Natonin, Mt. Province. The study assessed the changes that has occurred in the rice terraces and their impacts on labor dynamics and food security. To obtain the necessary data, a timeline workshop was conducted for each site involving ten farmer key informant for each study site and validated by a separate group of ten farmers. The result showed that the rice terraces started mainly as a traditional type of farming system relying mainly on human labor using farming practices developed and handed down from older generations. The modern farming innovation adopted by farmers are: substitution of traditional rice varieties to high yielding rice varieties, use of commercial fertilizers and pesticides, farm mechanization with hand tractors, rice threshers and rice mills and improvement of irrigation canals. High yielding rice varieties increased yield of rice by 50% to 70% vis a vis the traditional varieties and enhanced the food security situation in the rice terraces.

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I. Introduction

The Cordillera region in the northern central part of the Philippines is home to the most extensive rice terraces in the Philippines. Carved along the steep sides of mountains, it is consideredan ingenious agricultural system built by the industry and shear agility of a peculiar group of people. It is estimated to be more than 2000 years old (Conklin 1980) and shaped the lives of many families who depend on it for survival. Rice terraces cultivation has become a part of the people's cultural heritage. For over many centuries, the rice terraces operates traditionally relying mainly on human labor, crude farming implements and organic systems. Since the 1980s a growing literature within environmental sciences, ecological anthropology, and resilience theory has stressed the potential role of traditional knowledge for nature conservation and sustainable natural resource management (Gadgil et al. 1993; Toledo 2002; Ballard &Huntsinger 2006; Berkes& Turner 2006).

The 70's to the 80's saw the intrusion of modern agriculture within the tradition farming system. According to Baggethun et.al (2009) as societies modernize, the traditional role of local ecological knowledge in natural resources management are being contested by rapid transformation. Rice terraces cultivators continue to endure persistent pressure to adopt new farming innovations to combat declining productivity, control the emergence of new pest and diseases and meet changing demographic trends.

The study was conducted to understand the changes that has occurred in the rice terraces and how they impact on labor dynamics and food security. The end goal is to compare these changes with other agricultural heritage systems and facilitate a platform for interactions among various stakeholders of traditional agricultural systems around the world.

II. Materials and Methods

To understand the series of changes that has occurred in the rice terraces, an agricultural timeline was derived based on the narration of ten (10) key informants in each of the study sites. Each timeline was obtained through a series of workshops conducted with key informants. A Focus Group Discussion (FGD) involving a separate set of 10 farmers was assembled to validate the correctness of the timelines that was obtained from the first group. Corrections were made in the timelines to reflect what was perceived to be the correct information.

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The timelines was based purely on oral recalls wherein key informants are tasked to recall different time periods that new agricultural innovations were introduced in the rice terraces.

III. Results and Discussion

The summarized timelines for each of the study site is shown in Figures 1, 2, 3 and 4. The timelines were traced from its initial phase covering the earlier years prior to the 1970's and succeeding years from the 1970's up to year 2010. Three important features of the rice terraces was included in the timelines namely: farming practices, consumption and marketing patterns and the sources of information that aided farmers to adopt the series of changes that has occurred in the rice terraces.

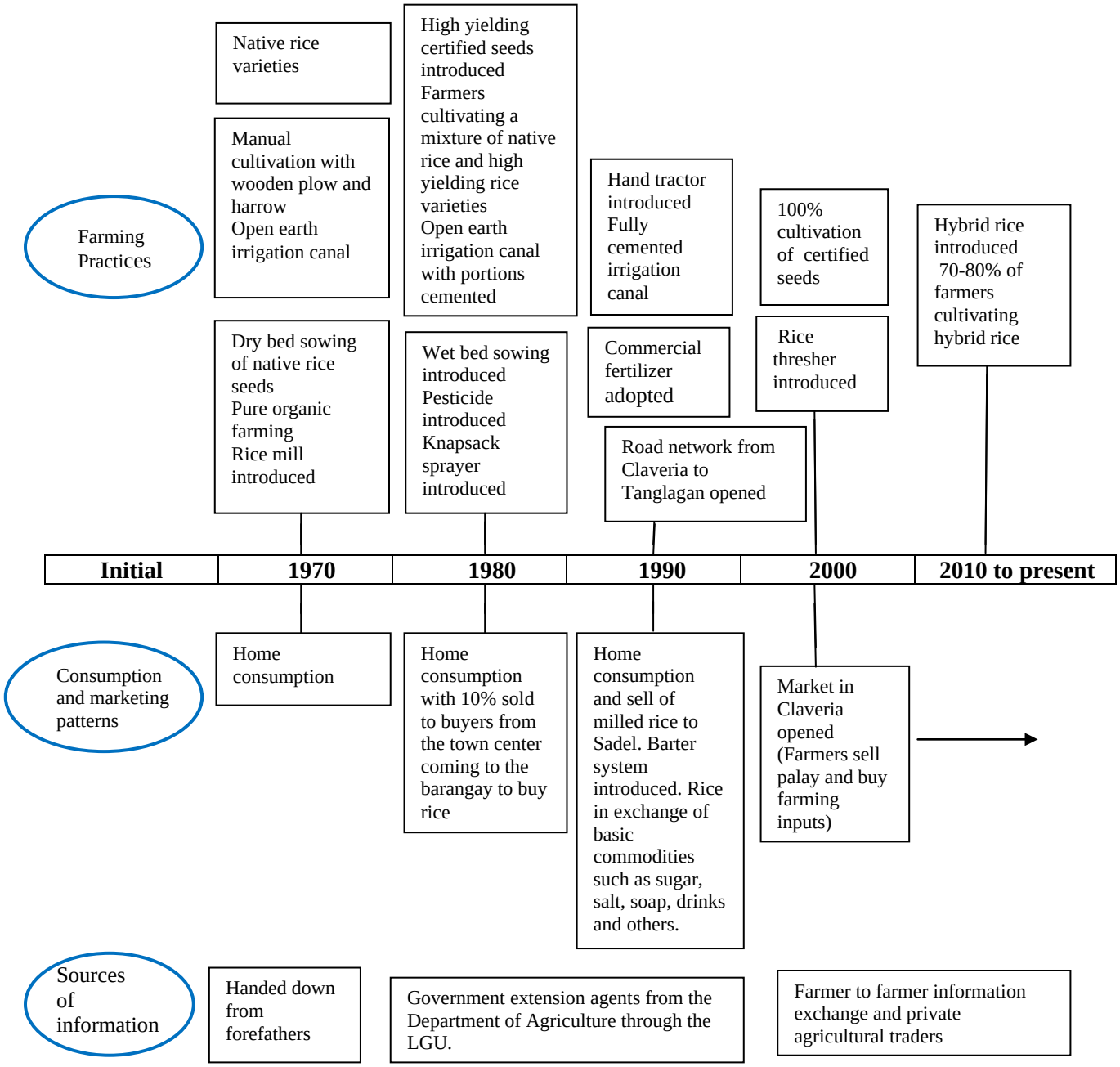

Figure 1 : Tanglagan timelines

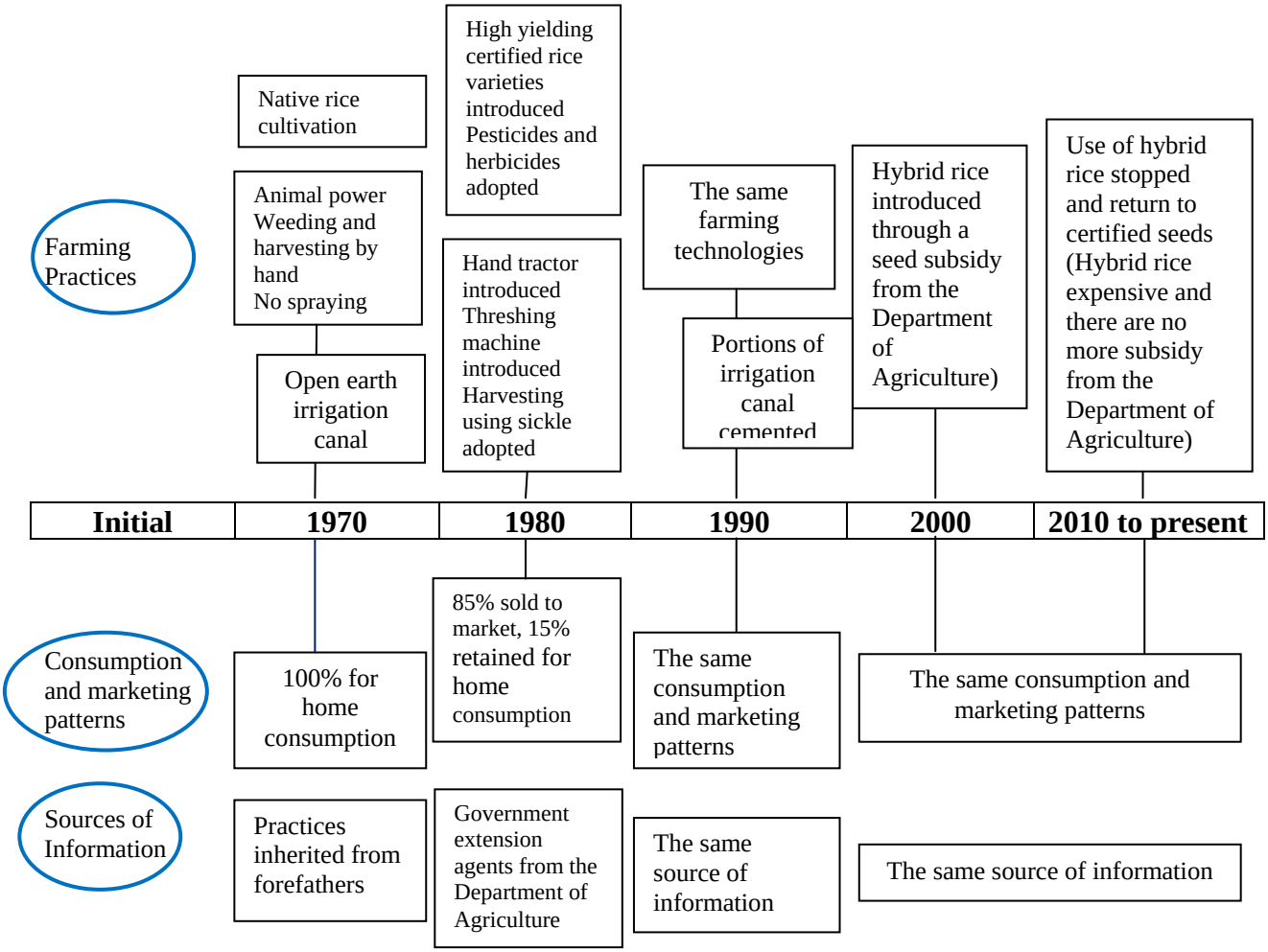

Figure 2 : Bagumbayan timelines

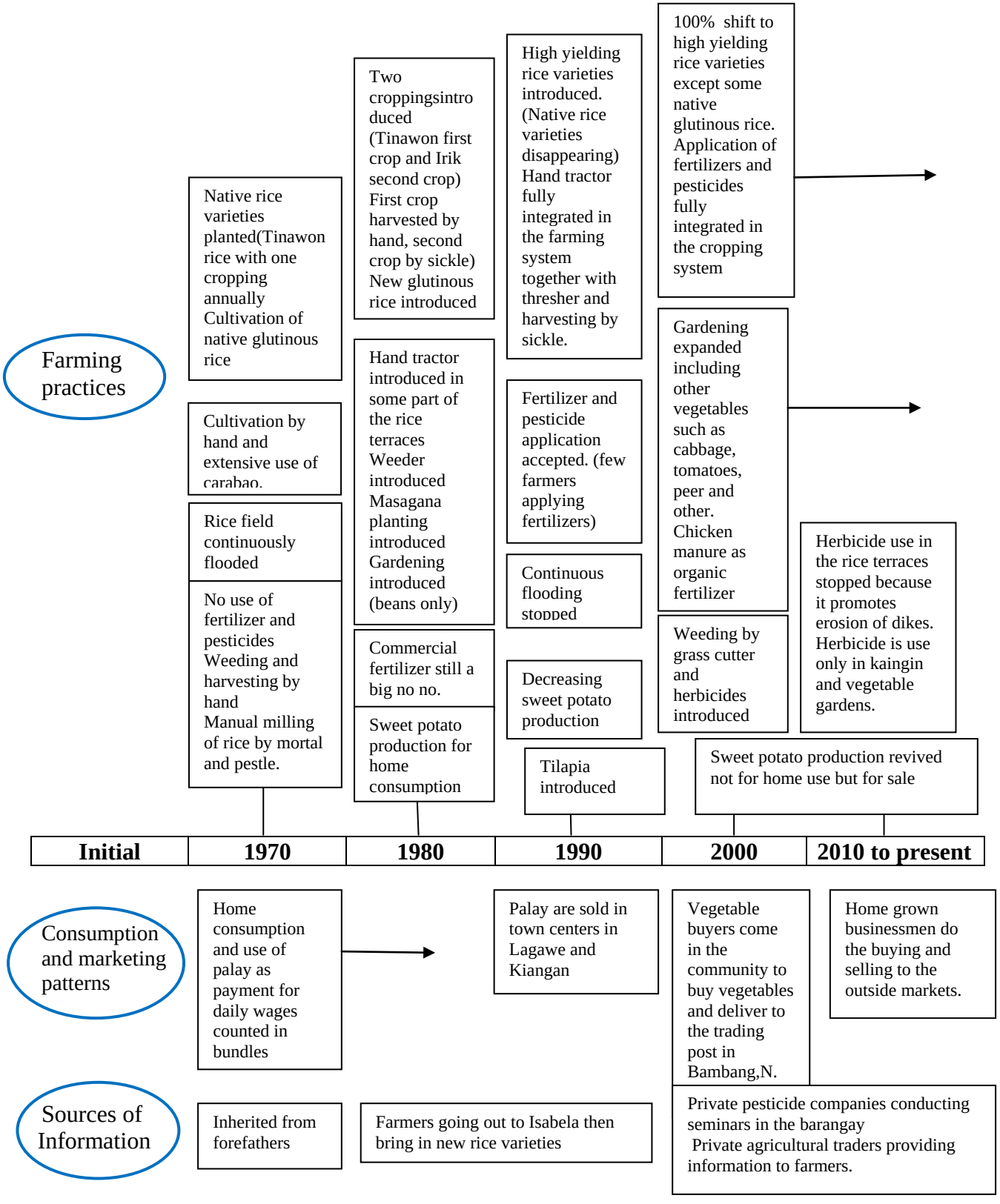

Figure 3 : Asipulo timelines

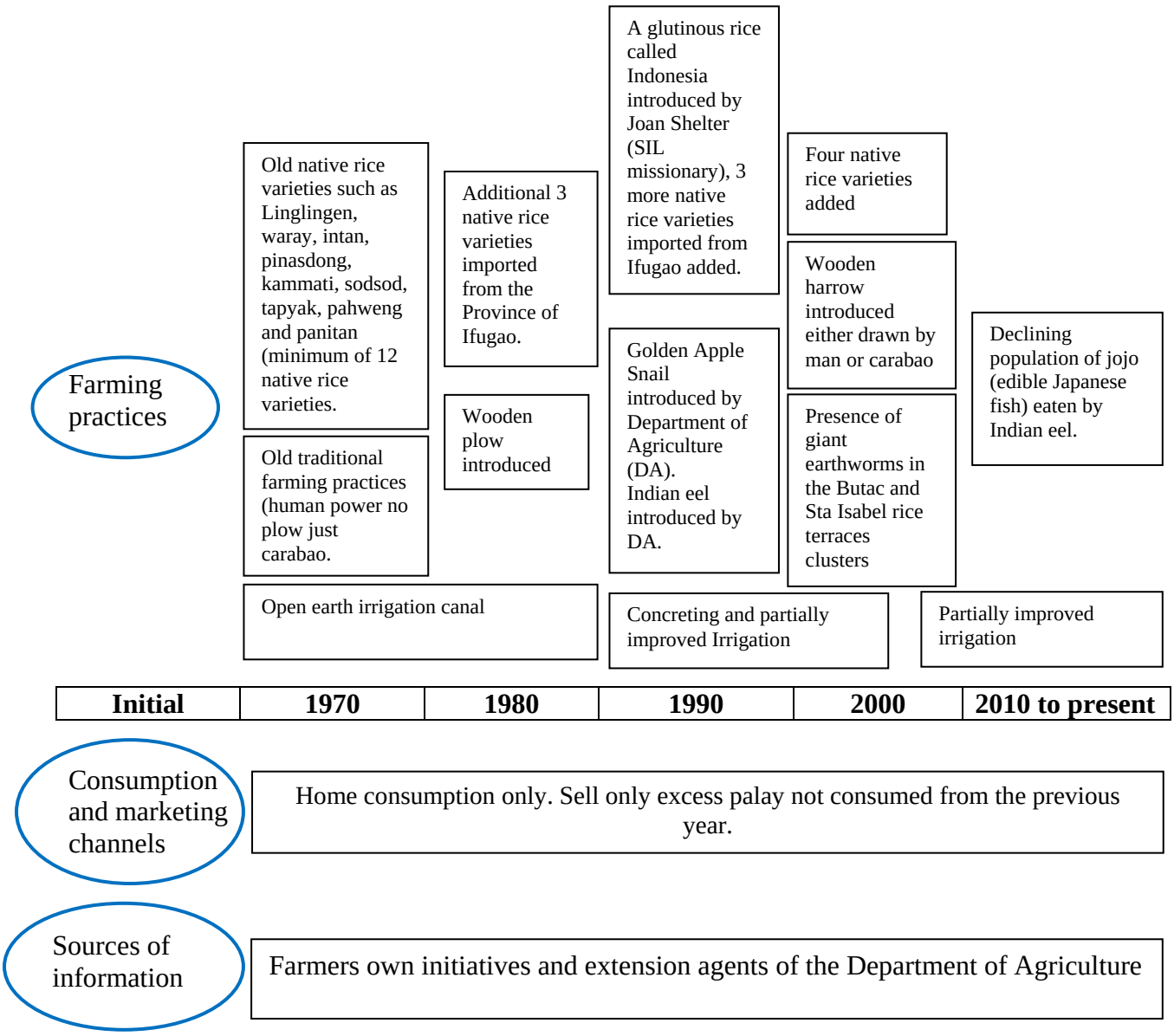

Figure 4 : Natonin timelines

IV. Lessons Learned from the Timelines

a) Farming Practices

It is clear from the timelines that the rice terraces started as a traditional farming system based purely on organic systems and the cultivation of traditional rice varieties. Land preparation is done manually by hand and foot with the aid of simple implements such as shovel and spade. In some of the study sites, cultivation is aided by draft carabaos with the wooden plow and harrow. Farming practices evolved locally without any form of external intervention and handed down from one generation to generation.

The 1970's to the 80's were the years that saw the intrusion of modern farming innovations and practices in the traditional rice terraces system. The entry of these modern farming innovations transformed the rice terraces into a mixtureof both traditional and modern farming systems. Modern farming innovations led to the alteration of the rice terraces into three types namely: a) rice terraces that persist with the old farming systemb. rice terraces that combines both old and new farming practices and c) rice terraces that shifted to modern farming practices.

Of the four rice terraces clusters evaluated, the rice terraces in Natonin, Mt. Province resemble the old and enduring old farming system. Farmers continue to cultivate the traditional rice varieties which was handed down to them by the older generation of farmers. The tedious preparation of the rice paddies is done extensively by both human and animal power. Cropping is done once a year but in recent years farmers have learned to do two croppings annually out of the need to produce more food.

The rice terraces in Asipulo, Ifugao featured the combination of both old and new farming practices. Farmers do two cropping annually, wherein the first cropping is devoted to the cultivation of the old traditional varieties while high yielding rice varieties are grown as second crop.

The rice terraces in Bagumbayan, Tabuk City and Tanglagan, Apayao are the two rice terraces clusters that completely reverted to modern farming systems. The short harvest cycle of 3-4 months allow farmers to do two to three cropping annually. These modern types of rice terraces are mostly found in the low lying areas in between mountains flanks that are traversed by roads and highways making them easily accessible to land transportation.

There are four prevailing modern farming innovations adopted by farmers in the rice terraces and these includes: the substitution of traditional rice varieties by high yielding varieties; use of fertilizers and pesticides, farm mechanization with the adoption of hand tractors, rice threshers and rice mills and improvement in the irrigation systems.

The adoption of high yielding rice varieties was the precursor to the adoption of modern farming practices in the rice terraces. The terraces clusters in Tanglagan were the first to migrate to high yielding rice varieties followed by those in Bagumbayan, Tabuk city in the province of Kalinga. In the case of Asipulo in Ifugao, high yielding rice varieties came only during the earlypart of the 1990's, however, farmers still continue to cultivate the traditional rice varieties alternately with the high yielding rice varieties. Almost all of the rice terraces clusters that has shifted to high yielding rice varieties are using commercial fertilizers and pesticides. However, in a 50-50 setting like those of Asipulo, Ifugao, farmers are still very prudent in using pesticides being restricted by local legislation. The underlying reason for the restricted use of pesticides is the preservation of aquatic resources which constitute an important diet of the local population. In the case of Natonin, Mt. Province, the major significant changes in the traditional farming system is the addition of three other traditional rice varieties imported from the province of Ifugao and the use of draft carabao and wooden plow replacing to a certain extent some of the manual cultivation practices being done by farmers.

Hand tractors replaced the tedious manual preparation of rice paddies. On the other hand, rice threshers and rice mills made post- harvest processing much easier replacing the tedious carabao threshing method and the old mortar and pestle de-hulling process.

b) Impacts of modern farming innovations/practices in the rice terraces

The adoption of modern farming practices in the rice terraces has numerous impacts on labor dynamics and food security in the rice terraces. First and foremost, the substitution of traditional rice varieties with high yielding rice varieties boosted rice yield from 50 to 70% comparedto the traditional rice varieties. This substantial increased in rice production enhanced the food security situation in the rice terraces where families no longer experienced acute food shortages during the rest of the year. High yielding rice varieties created a fit between subsistence and the cash market where farmers produced rice not only for home consumption but also fed in the local market (Ngidlo, 2014).However, the rugged topography prevents further expansion of the rice terraces space. The area of rice terraces owned by families ranges from a few hundred meters seldom exceeding one hectare.

The use of commercial fertilizer and pesticide came only as a precursor to the adoption of high yielding rice varieties. Commercial inputs such as fertilizers and chemical sprays are indispensable to the cultivation of high yielding rice varieties. Farmers have no other recourse but to dispense these expensive inputs to sustain yield and control pest and diseases. Commercial fertilizers has made nutrient management in the rice terraces much easier and continuously sustain higher levels of production. On the other hand, pesticides supplanted the labor intensive manual removal of pest reducing crop losses substantially.

c) The use of hand tractors, rice threshers and rice mill

The rice terraces clusters in Tanglagan, Apayao province were the first to break the tradition of manual cultivation by employing draft animals (water buffalo) in the preparation of the rice terraces. Subsequently, farm mechanization was adopted with the introduction of hand tractors and rice threshers. Rice milling was also introduced later when the volume of harvest increased making it impractical to mill rice manually. Farm mechanization made the work much easier and lessen the number of man days spent by farmers in tending the rice terraces. It has removed labor bottlenecks associated with land preparation, weeding, pest management and post-harvest processing. However, in spite of mechanization, the carabao still remain an indispensable partner of the farmer used in cutting corners which could not be reached by the blade of the hand tractor.

d) Improvement in the irrigation system

The improvement of the irrigation system in many parts of the rice terraces started way back in the 1990's chiefly through the intervention of the National government of the Philippines through the National Irrigation Administration. In earlier years prior to the 1980's most of the irrigation system in the rice terraces are considered crude sourced out along creeks and channeled along open earth canals. Poor irrigation and drainage in earlier years may have led to enormous water losses but today, most of the rice terraces in the

Cordillera region is serviced by improved irrigation system courtesy of the national government. Farmers in Bagumbayan, Tanglagan, Natonin and Asipulo enjoy the services of a much improved and centralized irrigation systems. The importance of water in securing a good harvest cannot be overemphasized thus, improved design and better management of irrigation water by farmer stakeholders contributed to higher productivity in the rice terraces.

e) Consumption and marketing patterns in the rice terraces

Throughout the Cordillera region in the northern central part of the Philippines rice growing in the terraces is purposely for subsistence or home consumption. The early builders of the rice terraces never intended to grow rice for commercial purposes. Under the traditional management scheme, 80-90% of the rice harvest are kept for home consumption while only around 10-20% are sold to buyers within the community. At other times only the excess palay not consumed from the previous harvest are the ones being sold locally. In Tanglagan, a barter system was introduced in the early 1990's wherein rice was bartered for basic commodities such as salt, sugar, soap, coffee and other forms of groceries. In Ifugao, traditional rice is given as payments for labor services rendered in the terraces. Five bundles of unhusked rice is the equivalent pay for a day's work which roughly corresponds to 8-10 kilos of clean milled rice. Under traditional rice varieties, palay harvest is seldom enough to support the food needs of families the whole year round except for those who own wider rice terraces and fewer mouth to feed.

The consumption and marketing patterns for palay derived from high yielding rice varieties differ with that of the traditional rice. Farmers adopt a 50:50 split arrangement wherein 50% of the harvest is kept for home consumption and the other 50% is sold in the market. In Bagumbayan, palay grains are sold to rice traders in nearby Tabuk city while in Tanglagan, palay is sold to rice traders in Claveria, Cagayan province approximately 35 kilometers away. In Asipulo palay is sold either in the municipalities of Kiangan or Lagawe where rice traders are stationed.

V. Sources of Information

The capacity of farmers to change their agricultural practices is hinge on two important resources and these are: information/communication networks and the availability of financial resources to support the intended changes. Four modes of information sources can be picked from the timelines namely: inheritance and tradition, government extension agents, farmer to farmer contact and agricultural traders/ technicians. The timeline shows that prior to the 1980's, the rice terraces was purely traditional in nature meaning farming practices are inherited from one generation to another. The repetitive nature of these practices could have lasted for more than 2000 years. The transition to modern agriculture paved the way for the adoption of high yielding rice varieties and other modern farming practices associated with it. The entry of high yielding rice varieties did not came by accident but the deliberate efforts of government extension agents from the Local Government Units. Seeds were given free to farmers and followed by lectures and teaching sessions on how to grow these new rice varieties. On the other hand, the spread of pesticides and fertilizers is said to have come from the works of pesticides and fertilizer dealers where farmers buy their farming inputs. In the Tanglagan area rarely visited by extension agents, agricultural traders were the most dominant sources of information. Farmers and private agricultural traders interact constantly seeking to negotiate and create opportunities to fulfill their needs and pursue their business interest. In the process of negotiation, information is exchange on the latest product, market prices, technology and practices.

At the farm level, the supply of information on the efficiency of a particular rice variety or a brand of pesticide is spread through farmer to farmer contact. Farmers themselves (particularly the early users) are the vital source of information by sharing their farming experiences to other farmers who in turn try the same innovation or product. Rice terraces farmers are a closely knitted groups, thus they share information quite easily on the usefulness of a particular product which they used or are currently using. In the same manner, input/output price information also comes from other farmers but businessmen provide the information as well.

The financial capability of farmers is one aspect that may either promote or limit changes in agricultural production. Except for Asipulo being serviced by credit cooperative, the other three sites do not have access to credit. Farmers depend on credit facilities from immediate family members, neighbors and friends. Farmers in Bagumbayan displayed a keen interest on government subsidy for hybrid seeds for them to increase returns from the rice terraces. However, government subsidy cannot be relied upon at all times. Farmers themselves have to develop local strategies to continue with newly introduced innovations

VI. Conclusion and Recommendations

The 70's to the 90's of the last century where the most critical years in the history of rice terraces cultivation in the rice terraces. Under constant pressure to produce more food, farmers with the help of extension workers from the Local Government Units started to experiment on the cultivation of modern rice varieties. With very promising results, farmers started to

abandon the traditional rice varieties in favor of these modern rice cultivars. The transition to high yielding rice varieties converted the once subsistence economy to a market oriented agricultural economy. Although limited in scale compared to lowland standards, it has open new ways wherein famers can earn additional income from the sale of palay harvest. Modern rice cultivars substantially increased the level of rice production and has improved the food supply situation in the terraces. In recent years, farmers alleged that it has become doubly difficult to find hired hands to help families do the tedious manual works in the rice terraces. The arrival of the hand tractor eliminated the need for hired labor and families can do the work alone in their own rice field. Farm mechanization reduced the number of man-hours spent by farmers in preparing their rice terraces which they can use for other productive activities. It has also removed labor bottlenecks by eliminating the tedious manual labor situation in the terraces.

The contemporary issues affecting the rice terraces are poverty and food insecurity. To secure a more stable food supply, farmers must learn to go beyond subsistence to create surplus production for the market. However, committing the rice terraces to the commercial production of rice is not possible considering spatial limitation and the need to preserve traditional knowledge. The rice terraces is a complex social-ecological system in which the biophysical system (land, forest and water), human culture and livelihoods are linked together. With these complex interaction, there is a need to balance the utilization of the rice terraces to both modern and traditional agriculture. Higher elevation terraces made up of approximately 70% of the total land area of the rice terraces must continue to retainits traditional character for the preservation of traditional knowledge and practices. On the other hand, the relatively flat to slightly rolling terraces (typical of the rice terraces in Tanglagan and Bagumbayan) found along river systems and easily accessible by land transportation can be committed to the growing of modern rice cultivars. The concentration of modern rice cultivars to the relatively flat terraces facilitates the transfer and movements(from the road to the rice paddies and from one rice paddy to another) of hand tractors and isolate the possible negative impacts of insecticides and fertilizers on water and aquatic biodiversity. To improve income flow and food security in the rice terraces, it is necessary for farmers to learn how to use their rice terraces to create other alternative sources of income. The following are the policy recommendation to enhanced food security in the rice terraces.

1. Increase investments in agricultural productivity- there is a need to design an investment program that can possibly diversify sources of income. Aside from rice production, the rice terraces offer various options for investment in fisheries, duck production and shell-fish integration schemes. Investment in irrigation infrastructure is also needed and should form part of the investment policy to promote agricultural productivity.
2. Extension programs- changes in the rice terraces is inevitable and therefore extension programs can play a vital role in thetransfer of appropriate technology, facilitating interactions and promoting capacity among farmers. Extension services that caters to the conservation of the multi-functionality of the ice terracesis very much needed. In addition, extension services that help enhanced the skills of farmers to diversify livelihoods as mentioned above are very much welcome.

VII. Acknowledgement

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