

Adaptation of rice cultivation to climate and socio-economic changes in the Ifugao Region (Philippines)

Adaptación del cultivo de arroz a los cambios climáticos y socioeconómicos en la región de Ifugao (Filipinas)

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Summary

The object of this article is to analyze the forms and limits of adaptation of the region's rice cultivation combined with the changing local ecological conditions and a changing socio-economic environment. Based on ethnographical studies undertaken among Ifugao people in the Philippines, this paper aims at contributing to produce knowledge about the construction of rice agricultural practices forced to adapt to socio-economic and climate change. However, six years after having classified the site as a patrimony of humanity, UNESCO, announced its concern for these rice terraces by including them on the list of world heritage sites in danger. Indeed, the Batad rice terraces are showing signs of deterioration. The destruction of rice terraces and the fragile ecosystem they rely on, would generate a disaster, not in terms of loss of human life, but in agricultural and cultural terms.

Keywords: adaptation, socio-economic change, climate change, rice, Ifugao.

Resumen

El objetivo de este artículo es analizar las formas y los límites de adaptación del cultivo de arroz de la región combinado con las cambiantes condiciones ecológicas locales y un entorno socioeconómico cambiante. Para ello se basa en estudios etnográficos realizados entre personas de Ifugao en las Filipinas e intenta contribuir a producir conocimiento sobre la construcción de prácticas agrícolas de arroz obligadas a adaptarse al cambio socioeconómico y climático. Sin embargo, seis años después de haber clasificado el sitio como patrimonio de la humanidad, la UNESCO anunció su preocupación por estas terrazas de arroz al incluirlas en la lista de sitios del patrimonio mundial en peligro. De hecho, las terrazas de arroz de Batad muestran signos de deterioro. La destrucción de las terrazas de arroz y el frágil ecosistema del que dependen generaría un desastre, no en términos de pérdida de vidas humanas, sino en términos agrícolas y culturales.

Palabras clave: adaptación, cambio socio-económico, cambio climático, arroz, Ifugao.

Introduction

The Republic of the Philippines is a country consisting of an archipelago of 7,107 islands, with eleven of them containing over 90% of the land and only 2,000 of them inhabited. Three zones are to be distinguished: Luzon, Visayas and Mindanao. The zone of Luzon is considered to be a zone historically affected by typhoons.

This paper is based on ethnographic investigations carried out in the North of the Island of Luzon, more precisely, in the (*barangay*) district of Batad¹(municipality of Banaue) which is in Ifugao province, itself located in the Cordillera Administrative Region. On the methodological level, the data was gathered during participative observations, observative participations in the rice terraces and in-depth interviews.

The term Ifugao, the name of the province is associated with the populations living there, indicates a group of wet rice growers of Malayan origin occupying the mountains of Northern Luzon. This population is one of the most intensely studied among Southeast Asian societies (Conklin 1980), among other things, for their extremely complex terraced rice growing system. The peasants still produce wet rice (rice grown in flooded ground as opposed to what is called "dry" rice production). This technological prowess testifies to a harmony of cultural activities in rhythm with the climate and water management, which allows the peasants to make rice grow at over 1,000 meters of altitude.

The principal occupation of this Ifugao peasantry is producing wet rice for self-consumption (Scott 1958). The size and quality of the rice terraces, inherited by primogeniture, symbolizes the family's economic status and social rank in the community. If they do not own rice terraces, the peasants acquire rice in exchange for their labour. Yet only the traditional chieftaincies had the habit of eating rice three times a day. For the remainder, their diet was essentially completed by sweet potatoes, as it is today by commercial rice.

Distributed in various *sitios* on the mountain slopes, the Batad population numbers around 1 024 inhabitants for 1 240 ha (National Statistics Office, 2010). The domestic units raise farmyard animals and cattle as well as cultivating vegetables on burned areas above the rice terraces. Although rice cultivation remains a central element, the Ifugao have been taking their place on the labour market since World War Two in diversifying their non-agricultural economic activities (working in the mines, road construction, agro-industry).

The Batad rice terraces have been classified as a world heritage site by UNESCO since 1995 and also figure among *Globally Important Agricultural Heritage Sites (GIAHS)*².

¹ Batad is located 350 km from Manilla, or around 10 hours by bus from the capitol in Banaue, one hour in *jeepney* from Banaue to Saddle Point and an hour's walk from Saddle Point to the *barangay* or district of Batad

² These rice terraces are one element in an integral indigenous Ifugao agro-ecosystem (Jianchu and Ruscoe, 1993). Among other things, rice production is made possible thanks to the *Muyong's* indigenous management skills, an agroforestry system situated upstream from each group of terraces and allowing their irrigation and fertilization. This collectively managed forested zone which is to be found above the terraces contains roughly 264 species of indigenous plants, mainly endemic to the region.

However, six years after having classified the site as a patrimony of humanity, UNESCO, announced its concern for these rice terraces by including them on the list of world heritage sites in danger³ (*List of World Heritage in Danger*). UNESCO underlines the lack of political measures taken to help the Ifugao preserve their terraces.

The Batad rice terraces are showing signs of deterioration. In 1990, a severe earthquake damaged some of the terraces' irrigation systems, while the El Niño climatic phenomenon has caused droughts, allowing enormous earthworms to erode the terraces' soil. In 2011, a combination of drought and heavy rain caused landslides and the collapse of entire sections of walls in the principal amphitheater of Batad, as well as an opposite slope in 2013.

As part of the Cordillera, the Batad Mountains serve as a rampart against typhoons. But the peasants are subjected to torrential rains generated by the typhoons. Typhoons are so frequent that they may readily be said to form part of daily life in the rainy season. Still the inhabitants are astonished to see typhoons forming outside the periods they were usually limited to⁴: "there were typhoons before, but in a seasonal way, meaning during a limited period of time. But now, there are typhoons all the time. What people say is that the typhoons have multiplied" (Fourth Assessment Report, 2007, p. 9).

The destruction of rice terraces (in being abandoned or through lack of maintenance, or through natural phenomena such as El Niño or typhoons) and the fragile ecosystem they rely on, would generate a disaster, not in terms of loss of human life, but in agricultural and cultural terms. The object of this article is to analyze the forms and limits of adaptation of the region's rice cultivation (to be understood in the polysemous sense of the term: agricultural operations and cultural elements) combined with the changing local ecological conditions (among which climate) and a changing socio-economic and cultural environment. These reflections will allow us to suggest prospective scenarios regarding the survivability of the local rice growing peasantry and their skills on the subject of this ecosystem.

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³ In 2002, President Arroyo transferred jurisdiction of development of the terraces from the Department of Agriculture to the Department of Tourism. Yet, while tourism provides additional revenue for the farmers, these terraces nonetheless remain above all agricultural lands.

⁴ With precaution, the Fourth Assessment Report of the IPCC describes the correlation between the probability of a human contribution and increases in the intensity of tropical cyclonic activity as "more likely than not" ("The Physical Science Basis, Summary for Policymakers", in IPCC, Fourth Assessment Report, 2007, p. 9). As to the Fifth Evaluatory Report of the GIEC (2013), it refutes the preceding hypothesis. According to the authors of the chapter "Detection and Attribution of Climate Change: from Global to Regional" of the report "The Physical Science Basis. Contribution of Working Group I", the confidence level would be low as to long term increases in tropical cyclonic activity (Bindoff *et al.*, 2013, pp. 913-914). Uncertainty also remains as to whether or not natural inter-annual variability has affected past changes in the domain of cyclonic activity.

regarding the survivability of the local rice growing peasantry and their skills on the subject of this ecosystem.

Materials and methods

On the methodological level, the data was gathered during participative observations in the rice terraces and in-depth interviews. It should be noted that the ethnographical work carried out in the last fieldwork in January 2015 took place during the sowing period. Accompanying the women in the rice terraces led to me work in much closer proximity to them. Also were used methods of the theoretical level of knowledge as analytical - synthetic, inductive - deductive and historical - logical, among others, to interpret the information and describe the results.

Results & Discussion

With the domestication and selection of seed having existed for millenia, for the Ifugao, rice is a spiritual bridge with ancestors who, over the centuries, honed their skills through trial and error (Santiaguel 2010). Rice thus forms part of the Region's culture and identity, as do the splendid rice terraces the ancestors carved out of the mountain slopes. Understanding evolutions in the recourse made to varieties of rice allows us to question the durability and biodiversity of rice growing systems in the mountains.

Produced in an entirely ecological manner, *tinawon* rice is one of the inherited aromatic native rices suited to this cold climate zone. Requiring six months to grow to maturity, it is only cultivated once a year. A wide genetic variety of *tinawon* exists.

With a view to optimizing agricultural production and improving the livelihoods of populations, in the 1970's, the Ifugao Government encouraged the introduction of new varieties and a second harvest a year. Mechanization being impossible in this region, "agricultural modernization" was carried out in adopting new, faster growing seed varieties.

The inhabitants of Batad describe this adaptation to new rice varieties as a long term and non-coercive propagation process. Its lack of resistance to disease and pests (rodent, birds and molluscs) attracted by its odour when flowering, were given by the peasants as some of the reasons discouraging them from sowing that variety of the ancient, aromatic rice. Rices not-originating in those rice terraces (such as California rice) were little by little adapted to the altitude by the peasants. Those rices are appreciated for their high yield (from 7 to 12 panicles, whereas the old rices had between 3 to 7) and a shorter growing period (one hundred days from sowing) compared to native rice, allowing an increase in yearly harvests (Sekimoto and Louis, 2012).

In Batad, there is a constant interest in experimenting with new seed. A certain rice, called "Sifor", was for example adopted in Batad a few years ago and then abandoned. A peasant explained that its "skin" was too thick: "Hard to pound and hard to decompose".

Besides having to be resilient to hydroclimatic threats (typhoons and drought periods), the rice sown in the rice terraces below the hamlets (*sitios*) must prove to be largely unaffected by the polluted water draining in there. The faecal waters, formerly considered a natural fertilizer, today include waste waters containing cleaning products. "The native rice is more fragile", say the peasants. Those who continue planting it have plots downstream from the hamlets, described as being more fertile.

It is by observing the crops and harvests of peasants from other areas and, subsequently, of closer neighbors, that the adoption of new varieties is slowly undertaken. Sowing new seed is the fruit of exchanges between peasants, by barter (for a *bundle* of another variety), or through labour in the field. If the International Rice Research Institut (IRRI), and until recently the Central Cordillera Agricultural Programme (CECAP), played a key local role as regards biogenetic research, in the end it is hard to know who introduced the new varieties. Choosing the varieties to be sown remains the peasants' prerogative.

Offsetting this miraculous new productivity, is a downturn in varietal diversity⁵. If over 70 varieties of *tinawon* were listed in the 1970's, A. Druguet (2009) was only able to observe about thirty varieties during his investigations. The last census of patrimonial rices (heirloom rice varieties grown in the rice terraces of the Cordillera) was carried out by the Department of Agriculture (DA) in the Cordiella Administrative Region in 2009 (Domoguen 2011).

The DA list suggests that native rice biodiversity losses in the provinces of Kalinga, Ifugao and Mountain Province: "closely associated to the people's culture and traditions, the cultivation of heirloom rice in the terraces led to the development of indigenous and sustainable natural resources management, particularly the preservation of watersheds, in situ food biodiversity, village social capital, festivals and others" (Domoguen 2011). For these reasons, after having sought the distribution of high output varieties, the DA is now encouraging a return to inherited rices. The DA is now asking the heirloom rice growing municipalities and provinces of the Region to prepare their own rice self-sufficiency roadmaps⁶.

Incorporating these new faster growth varieties, as well as transplanting techniques, into the rice growing system, led to the possibility of having two harvests per year. However, in the 1990's, although the production of *camote* decreased and the demand for rice increased⁷, with the Ifugao population augmenting appreciably, the double harvest system was little by little abandoned in Batad. In such a context, it is interesting to find out why most of the peasants returned to a single harvest.

The number of harvests, a symbol of evolutions in rice growing

The increase in the number of annual rice harvests generates questions relating to climate records and human resources. Accompanying agricultural activities by rites and

⁵ A study calls into question the loss of agricultural biodiversity due to the development of modern varieties (Steel *et al.*, 2009). The results of researchers of Field Crops Research show that the global genetic diversity has increased thanks to new varieties which have incorporated different, non-existent genes into local species. Yet assessment of this additional enrichment of genes should be tempered. These scientists concluded that the genetic diversity can only increase to the extent that a proportion of around 40% of cultivated land preserves traditional varieties. An increase in genetic diversity is thus only possible if the rate of adoption of hybrid varieties (resulting from a cross between local seed and exotic varieties) remains partial. Thus the introduction of modern hybrid seed does not eliminate the question of preserving traditional varieties.

⁶ This is particularly in response to the national programme «One Town, One Product», a project which consists in economically valorising one main agricultural product in each municipality.

⁷ Another source of proteins is the *camote* (*Ipomoea batatas L.*), or sweet potato, cultivated upstream the rice terraces or on mountain flanks not given over to rice growing. Introduced by the Spanish colonizers, the *camote* is a security staple for the Ifugao in case of poor rice harvests. But its production in Batad has been reduced to nearly nothing in the last few decades following an uncontrollable and uncontrolled invasive plague, still uncontrolled today.

ceremonies by *mumbaki* (shamans), to be defined in the socio-cultural domain, will not be dealt with here.

a) Climatic aspects

The new varieties of rice, sown twice a year, are sown around the months of September and March and harvested around January and July. The second harvest is thus sown during the rainy season (ranging from June to November) which coincides with the typhoon season (from June to October). Varieties of rices which grow in continuously flooded ground are varieties with rather long stems. These varieties are vulnerable to strong wind and heavy rains, explains a peasant: "During the rainy season, the grains don't develop well... There are not enough grains of rice in the ear. That's due to typhoons and wind during the flowering. For if the flower is soaked, the development is interrupted and there's no pollination."

Yet the Batad peasants remark that the new varieties of rice, like the California, have sturdier stems. But the negative aspect of that sturdiness is a slower decomposition than the native rices. And in Batad, where chemical additives have not yet been introduced, the stems, once the terrace has been harvested, are mixed with mud as a natural fertilizer. A slow organic decomposition in turn slows down the rice terrace's fertilization, resulting in a second harvest of lesser quality.

The uncertainty of the climate in these latitudes is a given with which indigenous Ifugao populations have always had to cope, among other things by organizing annual religious festivities. But according to local talk, extreme weather conditions (such as downpours, typhoons, droughts, and extremely cold temperatures and fog) are intensifying today, with climate change exacerbating the rice terraces' vulnerability (Ngidlo, 2013). The role research in agricultural sciences and, more particularly, seed companies will have in the future development of varieties with high levels of tolerance for combinations of climate stresses is certainly not negligible⁸.

Extreme weather events as well as the decomposition of the plants have led to a readjustment of the agricultural calendar, with many Batad peasants abandoning a second harvest. In addition to repairs of the rice plantation's irrigation systems and walls, the availability of labor to ensure a second harvest must also be taken into consideration.

A. Human resource aspects

For the rice to grow under good conditions, there is the preliminary matter of preparing the rice terraces: cleaning the small levees and repairing the walls, pulling the weeds and mixing them into mud as fertilizer, gathering the devastating "golden cohols" and crushing their eggs, etc. Once rice terraces are ready to accommodate the rice, the young seedlings, sown beforehand in seedbeds, are meticulously uprooted and gathered in bundles. This female task, as well as the planting to come, involves their spending long days bent over with their hands in water. Growing immersed rice (transplanting,

⁸ Some researchers also underline the interest lying in research in the domain of sciences and technologies whose goal is increasing the yield and reducing the maturing time of traditional rice varieties, doing so, for example by increasing soil fertilities (Allig and Babang, 2015).

cleaning the terraces, choosing the seed, planting...) is done by women, while work involving irrigation and repairing the rice terrace walls is done by men.

In this traditionally self-subsistent community, situated outside of a market economy until World War Two (Jianchu and Ruscoe, 1993), abandoning a second harvest has provided the peasants the time to engage in lucrative activities. The introduction of obligatory schooling in the 1950's had crucial repercussions on the self-sufficient mode of production and cash requirements. While the primary school requires little financial commitment on the parents' behalf, the secondary school generates costs the peasant families cannot absorb with their agricultural practices of self-consumption. Once through primary school, students continuing their schooling must reside outside the barangay (district) of Batad. The parents prove to be imaginative in assuming the cost of boarding school⁹ (700PHP/month) plus school fees: migration to Banaue in the tourism sector, to Baguio for work in the seasonal market gardening sector of the agro-industry, or to Manila in hopes of finding work there or abroad.

Exiting the peasantry thanks to education is perceived as an upward social mobility giving access to the comfort the consumption of material goods allows: "If you do nothing but work in rice, you won't have enough to pay for your children's studies; you'll have just enough to eat rice. However, plagues, typhoons and rats may come and destroy all your crops. If you have a job, you can work in the rice terraces weekends or pay people to do it for you." Cristina, helped by her husband, opened a shop to sell small-scale local handicrafts intended for tourists come to admire terraces classified as a world heritage site by UNESCO. Out of her eight brothers and sisters, Cristina is the only one not to have finished her studies at college and still living in Batad. All of her siblings have migrated to follow professional paths outside the community. They no longer contribute, so to speak, their physical force to agricultural tasks. They regularly send their mother money to hire labor at the time of heavy agricultural tasks (cleaning the rice terraces, planting, harvesting).

The young generations look down on field work: "Children no longer want to get their hands dirty. Before we made tools to match their size, but that no longer interests children today", explains Julia, sexagenarian. A Carmelite Sister in a barangay near Batad says: "the young people could learn it but they are no longer interested in this kind of work. They've gotten lazy. It's no longer attractive for them. And there's nothing to do here, no karaoke, no stores... few ways of earning money. And money's what's become the most important thing. Without money, you can't move."

Transmitting specialized techniques, like repairing the walls of rice terraces, runs into obstacles, such as young men disinterested in being taught by older men and the rarefaction of elderly having that know-how. However, in the absence of regular observation and repetition of those gestures, the techniques are lost. Cristina's eldest son, Buya, is looking for work. His mother would have proposed to him that he learn the technique of repairing rice terrace walls from his great-uncle, but Buya refused to take interest in those delicate and depreciated operations, preferring instead to work as a farm laborer in the agro-industry sector.

With the income generated by tourism, Batad today can count on finding an increasingly limited agricultural labor force among its inhabitants. Whereas a woman's

⁹ The exchange rate of the Philippine Peso is 1 PHP = \$0.02 US (December 2015).

salary for one day's work is 150 PHP (250 PHP for a man) and the earnings for an hour of massage, given to a tourist, for example, is 300 PHP, what peasant would be crazy enough to persevere exclusively along the path of rice growing? The diversification of professional activities other than agriculture for some, coupled with the desertion of rice growing for others, has reduced the production of local rice -generated mainly in only one harvest and no longer in two. This restricted production of rice has led to the need for rice known as 'commercial' being supplied from outside. This new type of purchase can only be assured by having a source of income.

Final considerations

In addition to abandoning patrimonial varieties, speaking more broadly, the cultivating of rice in this mountainous environment - as such - is threatened. We see abandoned rice terraces in some nearby barangays. This abandon may be explained by problems of access to water to irrigate the rice terraces, by major migratory flows towards cities but also by negligence in maintaining the small levees. Totally abandoning the rice terraces is a scenario which would place this priceless thousand-year-old heritage in danger and would thereby stop the tourist surge which, despite its often quarrelsome repercussions within the population of Batad, generates a considerable amount of money.

The peasants of Batad adapt their sowing to their needs for yield and resilience, with some leaving their rice terraces to ensure their offspring better professional opportunities. In fact centuries old lifestyles are thus being called into question to allow them to access what modernity seems to offer. But going to school is not enough to create a place for oneself in the active Filipino population, whose demography is galloping. Rex, a recent graduate, explained to me: "to find a job as a male nurse, there's a long list ahead of me. I do small jobs left and right, as best I can." A rural exodus towards a promised city seemed to be the panacea. But as the cities and the capital fill up, shantytowns spring up. Isn't it time to think about how to live better in the rural world?

Isn't it time to reflect on the organization of these peasant communities in order to avoid their desertion and, possibly, encourage returning migrants to take up agricultural activities? In turning their attention to alternative rural transformation dynamics (in highlighting their uncertainties, possibilities and complexity), researchers play an important role in imagining possible futures (Gibson, Cahill and McKay 2010).

The durability of systems of peasant agriculture is asked alongside the question of the diversification of activities in the agricultural operations concerned, like the delicate question of tourism: it allows us to maintain this peasant agriculture but also weakens it (by ostentatiously exposing the incomes tourism generates in comparison with agricultural incomes). The fragility of this ecosystem subjected to increasing demography, climate change, cultural and religious transformations and the flight of manpower attracts our attention to "hybrid forms of agricultural production" (Deléage, 2012).

"Food biodiversity is the work of men", to take up an aphorism formulated by John Tuxill and cited by Gary Paul Nabhan (2009). It relies on cultural and agricultural practices and "coevolves" with the human communities maintaining them in space and time (Brac de la Perrière, 2014). But the ethnic minorities who have contributed to developing this food biodiversity and preserving it are mistreated by our productivist capitalist system, which leaves them no other fate than urban emigration. We thus

heartily agree with the remarks of Larrère and Larrère (2009) on government's need to link nature and politics and to associate local populations with the protection of biological diversity:

To achieve sustainable development, local populations need the protection of a solid national political structure¹⁰ against an international market which threatens to destroy any of their activities which are not "competitive". As we have seen, imagining that local populations, directly confronted with the market, will preserve their traditional practices through a noble ecological conscience would amount to resurrecting the myth of the noble savage. (p. 306)

These reflections should lead us to think of a logic of remuneration for competencies in agricultural domains which would perhaps slow down the massive rural exodus. These considerations have led us to reflect on alternative logics for remunerating the peasants which, beyond the question of yield in resources per unit, would take evaluation of the positive externalities of peasant practices into account (an equilibrium of ecosystems, soil fertilities, an environment favoring social interactions, water conservation...).

Ifugao Province is in full mutation today but its inhabitants have shown great aptitude for reconciling tradition and modernity (Druguet 2009). This case study stresses the need for preserving indigenous know-how while remaining open to the outside. This peasant rice cultivation underlines the need for a balance between several factors:

- Access to natural resources in respecting the ecosystem's equilibrium (in breaking with a predatory and exclusively productivist logic);
- A stable climate (but threatened with typhoons and droughts);
- An availability of manpower and a transmission of know-how;
- The lifestyle aspirations of younger generations.

Climate change will certainly have negative effects on rice crop production (Stigter and Winarto 2013) and harm this agro-ecological equilibrium (Ngidlo 2013), but cultural changes (as, for example, the desertion of rice growing work) and technical changes will be more rapid and perhaps more devastating. Climate change will amplify the acceleration of conditions of socio-economic vulnerability (Oliver-Smith 2013). Hence we should not dissociate the analysis of socio-economic change, from analysis of the environmental change and we should ensure, as Ben J. Wallace (2006, p. 28) notes, "that people stand at the center of research and development in culture and agriculture".

¹⁰ The *Convention on Biological Diversity* (coming into force in 1993) recognizes the sovereign right of States to profit from and control the use of their genetic resources and traditional skills. As Larrère and Larrère (2009) remark, that quite obviously raises the question of the corruption of numerous developing nations

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