

The sustainable use and biodiversity of paddies, fields, and secondary forests in Louisiana

1. Introduction

The United States occupies the better part of an entire continent. Its geography is marked by diverse natural climates that include major mountain ranges, expansive prairies, and climates that span tropical to subtropical zones. The U.S. is a major agricultural producer, and much of its land is dedicated to farming, where wheat, corn, soybeans, and many other agricultural products are produced. The current paper is a case study of efforts aimed at the sustainable use of secondary natural features and the conservation of biodiversity in a particular region in the United States, a country with well-developed large-scale farming enterprises. The region examined here is Louisiana, a state that, thanks to its temperate climate and location as an alluvial flatland of the Mississippi River, has thriving agriculture, forestry and fishing industries which produce rice, sugarcane and other products.

2. Summary of the survey

Louisiana, the site of the survey, comprises about 130,000 square kilometers, roughly 110,000 square kilometers of which are land and 20,000 of which are water. About 57,000 square kilometers of that is forest. The north of the state is bordered on the east by the Mississippi River. The river cuts through the southern part of the state, which faces the Gulf of Mexico. To the west it borders Texas, and to the north Arkansas. Louisiana has thriving agriculture, forestry and fishing industries. Among its chief products are timber, rice, sugarcane, aquatic products (Louisiana is by far the world's largest producer of crayfish), and more. In addition to these, the state has well-developed chemical, petrol, and tourist industries.



Fig. 1. Louisiana State

Information in Louisiana was collected chiefly through interviews conducted from December 2 through December 11, 2009, in St. Martin Parish and other areas. In addition to the interviews, workshops were held with participants from Louisiana State University Agriculture Center and Louisiana State University itself, from whom data was also gathered.

3. Maintenance and biodiversity conservation in paddies combining wetland crop cultivation and crayfish harvesting

(1) Working wetlands

The term “working wetlands” in Louisiana refers to the fact that the state’s wetlands (paddies) serve multiple functions: they are used for the cultivation of rice and the harvesting of crayfish, and also provide habitats to waterfowl. In surveyed area of St. Martin Parish, for example, farmers allow crayfish cultivated in paddies to be fed on by waterfowl, thereby using the wetlands in a sustainable way and preserving biodiversity in the area.

(2) Changes in land use in St. Martin Parish

The land subject to the current study was at one time a forest, and the grandfather of the current farmer/landowner originally made his living through forestry. With the construction of levies along the Mississippi River in the 1920’s, it was transformed into wetland, after which it was used for paddy farming. Subsequently, the crayfish that thrived in the paddies were used as a source of food, but in the 1960’s, with the introduction of rice farming, the crayfish came to be cultivated for commercial purposes. In recent years, in light of unstable rice prices, crayfish are cultivated together with paddy agricultural products as a means to mitigate the business risks associated with growing rice mono-culturally.



Pic. 1. and Pic. 2. Study site in St. Martin Parish.

(3) Rice production

The farm in this case study is run according to the guidelines of the Louisiana Master Farmer Program. It consists of a roughly 400-acre tract of wetland that is used mainly for the paddy farming of rice.

Rice cultivation begins in the spring (March) when seeds are for the most part sown directly using a planting tractor, but occasionally small aircraft are used to sow seeds. Harvesting is done once or twice a year. The first harvest is in July, and depending upon how the rice has grown, there may be a second harvest, either in October or November. After seeds are sown the water level in the paddies is maintained at a depth of two inches for about two weeks. This depth is not only ideal for wading birds such as ibises and spoonbills (e.g. the American White Ibis), it is also effective for controlling weeds. The water depth is raised to four to six inches in conjunction with the growth of the rice plants, and is drained just before harvesting. The water used comes from settling ponds designed to

let the silt that has runoff from sugarcane fields settle. Water from the ponds is delivered to the paddies via pumps.



Pic3. Planting tractor.



Pic4. long-grain rice.

Rice is planted without tilling the land every year for three consecutive years, and is harvested around five times during this duration. In the fourth year the fields are filled with water and left to lie fallow, after which they are tilled and planted again. The rice produced is a long-grain variety that yields about 8,000 pounds per acre at the first harvest and 3,200 pounds in the second. The price for unprocessed rice is around \$22 a barrel.

(4) Crayfish cultivation

Purchased crayfish are released into paddies around May and June, when the rice planted in March has matured to a certain extent. Releasing crayfish into paddies at this timing affords them a certain degree of protection via the rice plants and lowers the levels of predation by waterfowl. The released crayfish reproduce before the first harvest. Crayfish grow by about 20 percent every time they shed their shells, but their maturation is affected by climatic and other conditions. The released crayfish grow by feeding upon aquatic insects and tadpoles that inhabit the paddies. They become cannibalistic when other sources of food are insufficient, so in the interests of maintaining a high level of biodiversity in the paddies, much care must be taken when using pesticides or fertilizers. Although the water is drained from the paddies immediately prior to harvesting, the crayfish survive the harvest by taking refuge in holes they dig in the paddy mud.



Pic6. Crayfish hole.



Pic7. Crayfish.

Crayfish are harvested after the rice, but at the farm in question the decision as to whether to harvest rice a second time or instead harvest the crayfish is made depending on factors such as the quality of the rice, rice prices, and crayfish prices. This sometimes means that rice is not harvested a second time. A crayfish harvest will generally yield 1,000 pounds per acre, with prices fluctuating somewhere between 30 cents to \$3 per pound.

Crayfish are harvested using specialized traps. There are two types of traps with mesh sizes of about 2 cm that are used so as not to capture crayfish that are too small. When water is added to the paddies, a screen is placed at the point of intake that keeps out bluegills and other fish that prey upon crayfish.



Pic8. Crayfish trap.



Pic9. Silt basin and screen.

(5) Biodiversity of the paddies and surrounding areas

At the farm that was studied, much aquatic life is used as a source of food, including frogs (frequently found in irrigation canals and caught at night), alligators, snapping turtles, etc. The Mourning Doves, Bobwhite Quail, and other birds are hunted for food. Many birds that are either predators or competitors to the crayfish have been confirmed in the paddies, and if one were to place emphasis only on the productivity of crayfish cultivation, such birds would be a nuisance. Despite this, at the site studied, paddies were used sustainably with the birds being allowed to feed upon the crayfish. Crayfish predators include herons, birds of the family Threskiornithidae (ibises and spoonbills), and gulls, with ducks and swans (but not geese) being competitors.

Also observed during the study were the white-faced Ibis, American white ibis, the great egret, the snow egret, the great blue heron, the mallard, the bald eagle, fire ants, crayfish, tadpoles, black rice (a type of weed), and water hyacinths, among others.



Pic10. Aquatic invertebrates collected on the study sites at St. Martin Parish.



Pic11. American white ibis.



Pic.12. Great blue

4. Conclusion

(1) The use of secondary natural resources in Louisiana

Natural areas have conventionally been converted into farmland based on the notion that nature is something to be conquered, but over the past two decades views of nature and ways to utilize it have begun to change. For example, environments inhabitable by rabbits, deer, bears and other wildlife are being created through reforestation by either sowing seeds from aircraft or planting directly in areas prone to strong winds. Large-scale sustainable farming is also gaining a foothold through decisions to plant crops other than corn, which imposes a significant burden upon the soil, on land traditionally used as cornfields, and to reduce or eliminate the use of pesticides and other agrochemicals. It should also be noted that the practice of hunting, which is a “consumptive” way of utilizing natural wildlife, is on the decline, while “non-consumptive” utilization, e.g. bird watching, is on the rise.

(2) Efforts at conserving or rehabilitating the natural environment

Examples of programs to conserve or rehabilitate natural environments in the United States include the Wetland Reserve Program (WRP) and the Conservation Reserve Program (CRP). These programs are designed to provide assistance in rehabilitating and protecting natural environments in areas of poor farmland.

The main goal of the WRP is to conserve and rehabilitate wetlands to serve as habitats for waterfowl. The program is voluntary and operates under 30-year easements. The CRP, on the other hand, is chiefly a reforestation program with the goal of preventing soil erosion that targets areas ill-suited to farmland. In addition to these, there is also the Environmental Quality Incentives Program (EQIP), which provides farmers with incentives for improving the environmental quality of their land.

The Louisiana State University Agriculture Center is appealing to the government to offer support for farms such as the one taken up here that utilize and conserve wildlife and natural resources such as crayfish, waterfowl, and water (levels and quality). The conservation of biodiversity in farming should also raise the level of biodiversity in areas surrounding wetland farms in Louisiana.

Bibliography:

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LSU AgCenter (<http://www.lsuagcenter.com/>)

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Wetlands Reserve Program (<http://www.nrcs.usda.gov/programs/wrp/>)