



Photo: MA SIPAG

The Oray family keeps different livestock for nutrient recycling, as a source of income and as a capital reserve in case of an emergency.

Transforming the land

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Large sugarcane plantations dominate the agricultural landscape of the Philippine province of Negros Occidental. In the mid-1980s, this dependence on a single crop resulted in widespread famine when world prices fell and the sugar industry collapsed. Many seasonal sugar workers were left jobless and poverty was acute. There was much social unrest and many families were forced to abandon their farms and homes. Although the world sugar market stabilized in the late 1980s, there was a clear need for crop diversification. Farmers like Rodolfo “Dolpo” Oray from the village of Tapi, set about converting their farms from sugar monocultures to more sustainable cropping systems.

Below subsistence farming (1984-1985)

Dolpo has been farming for more than 25 years. Before moving to Tapi, he had owned land in another municipality, but political unrest had forced the family to leave. In 1984, they acquired 1.3 hectares of land in Tapi from Dolpo’s grandfather. But years of sugarcane monoculture, regular post-harvest burning and chemical fertilization had left the soil in poor condition, and the slopes in particular were prone to erosion.

Convinced that monocropping would not satisfy his family’s needs and given the low market price of sugar, Dolpo decided to convert most of his new land to rice paddy. He put a lot of effort into levelling these rain-fed areas to ensure proper water management. He had to rent a costly water buffalo to complete

the levelling work and he was not able to plant his rice on time because he had to wait until the buffalo’s owner had finished his own land preparation before he could start to work. Late planting made Dolpo’s crop vulnerable to rice bug infestation. He realized he needed to have his own water buffalo and decided to start working in a nearby sugar plantation to save money to buy one.

The family relied on rice for most of its income. In order to add value to the crop, Dolpo decided to avoid middlemen and to market milled rice directly to his neighbours. The family also planted maize and some vegetables for home consumption, and started keeping a few livestock – a sow, a few piglets and chickens.

Self-sufficiency (1986-1987)

In 1986, Dolpo and his family took over 2.2 hectares of land that had formerly belonged to his grandfather but which a local landlord had absorbed into his sugar plantation. Dolpo spent a lot of time levelling and terracing the slopes. He devoted 0.5 hectares to rice cultivation, but planted most of his new land with maize. This crop involved significant investments. Money was spent on pesticides, inorganic fertilizers and renting a tractor. Unfortunately, the maize crop failed due to bad weather conditions and the family never recovered their expenses.

After the drought caused by the *El Niño* weather condition, Dolpo selected, propagated and planted drought-resistant varieties of indigenous tree species on the steepest parts of the

farm that had formerly been under slash-and-burn cultivation. Expanding and diversifying his cropping system proved to be extremely labour intensive and costly. Dolpo stopped working as a cane cutter in order to spend more time on the farm. Together with his youngest brother, Roden, the family planted vegetables and root crops that would sell well on the market.

From the money earned from the sale of pigs, rice and maize, Dolpo bought a water buffalo calf and in 1987, the animal was ready to start working. This reduced the cost of land preparation and meant rice could be planted on time.

As Dolpo began extending his cropping areas, he and his family drew up a plan for the continued development of the farm, including the planting of additional trees. Cultivation methods for rice, maize, banana and root crops were improved, and beans and peanuts were grown in rotation to improve soil fertility. At the same time Dolpo started to learn more about alternatives to expensive, conventional monocropping by attending regional seminars in soil and water conservation, erosion control and nursery management. The family was moving towards food self-sufficiency!

Generating surplus (1988-1990)

Dolpo became an active leader in the newly formed PATDA (*Pagnanawon Agricultural Technology Development Association*), a farmers' organization that supported farmers technically and financially. He and other PATDA members were given on-the-job coaching by an agronomist and a local NGO supplied them with revolving capital. PATDA set up its own nursery for vegetables, forest and fruit trees. Commercial trees, mostly mahogany, were planted on the extensive hilly part of the farm and served as a communal agroforest. Watering of the communal tree farm was possible through *dagyo*, a cooperative labour system.

A quarter of a hectare was planted with squash, but due to the low market price much of this harvest was fed to the pigs. Meanwhile the production of peanuts – which are easy to store – was expanded and Dolpo used the profits to buy an old but larger house adjacent to the family's homestead.

Dolpo procured nine traditional rice varieties from local sources and planted them on the upland part of his farm in continuous rotation, but he still maintained the conventional IR-64 variety, which required chemical inputs, in the lowland area. Although diversification laid the foundations for more productive land use, the transition towards fully organic farming could not happen immediately.

By combining his family's local experience and the knowledge he gained from training, Dolpo started to make organic fertilizer from water buffalo dung, decomposed weeds and rice stalks. He also continued rearing livestock. He introduced crop rotations using leguminous crops such as peanut, soybean, mung bean and cowpea. Thanks to the farm's crop diversity its vegetable garden harboured few pests and diseases and did not require pesticides.

Since the benefits of the arduous diversification process did not become apparent immediately, it was difficult in the beginning to convince everyone in the family to put their trust in the new farming system. Dolpo's wife Raquel, for example, questioned the value of contouring, levelling and planting the upland parts of the farm. Her main concern was to secure a quick and predictable harvest for her family. She was concerned that diversification efforts were putting their farm at a disadvantage.

In time, however, trust in the diversification process began to grow as the efforts made by all the members of the family began to pay off. Planting pineapples along the contour lines slowed erosion on the steepest slopes of the farm. Check dams and soil traps were dug on another part of the farm and trees were planted along the contour lines. These measures were very labour intensive and could be achieved only with outside help. Different species of trees and vegetables were planted throughout the farm. A small forest was established on the steepest part of the farm where cultivation was impossible. PATDA members worked together to help the family plant and water the seedlings.

Dolpo had a tough time balancing his farm chores with his increasing role in community affairs. His involvement in communal matters had grown substantially and in 1989 he co-founded a federation of producer organizations called BUGANA, and started providing free training in farm diversification. In return, he gained practical knowledge from the farmers he interacted with and collected different crop varieties. A training centre for BUGANA was established on the family's farm.

MASIPAG approach (1991-1995)

Through his institutional network Dolpo came in contact with MASIPAG, a farmer-led network of farmer organizations and local communities representing more than 30 000 farmers in the Philippines. MASIPAG promotes the sustainable use and management of biodiversity through people's control of genetic and biologic resources. It maintains a seed collection and encourages farmers to adopt the *Diversified and Integrated Farming System* (DIFS) approach. In 1991, BUGANA gained access to MASIPAG rice varieties, which grow well without the use of chemical fertilizers and pesticides. A total of 54 rice cultivars were selected for trials on Dolpo's farm. The trial farm helped the farmers observe and gather data on the performance of cultivars in terms of their adaptability to different soil types, pest resistance, productivity, taste, smell, and other considerations. After much effort, the Oray's had selected 15 rice-varieties for verification.

In 1995, the farm's entire rice area was planted with MASIPAG varieties. The Oray family rotated ten MASIPAG varieties, using at least three to four varieties every cropping season and storing another six for subsequent rotation. Tall and short cultivars were alternated to improve biomass and organic matter content of the soil, to facilitate nutrient cycling and the build-up of soil fertility. The family also discovered that many MASIPAG selections were well adapted to upland conditions and tended to have normal growth even with modest irrigation.

In 1996, these MASIPAG varieties produced 4800 kg/ha – a significant improvement when compared to the gains from high-yielding varieties (2520 kg/ha), see Table 2 on page 8. No inorganic fertilizers and pesticides were used. The money saved was invested in hiring labour for ploughing, harrowing and transplanting (Table 1, p. 8). Production continued at a high level except during periods of drought or rat infestation, and production costs have stayed low.

Improving on the MASIPAG model (1996-1997)

As Dolpo became familiar with the MASIPAG model, he started experimenting to solve specific problems on his farm. He invested some of his income in rearranging the layout of the family's farm to improve the integration of farm components and promote better nutrient cycling. One important change, relocating the

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>> house to the centre of the farm, symbolizes the essential role of the home in planning and monitoring the farm. He also developed pest management strategies. He planted taro near the rice field and this helped control the damage caused by snails that, in fact, prefer taro to rice. Rice hull thrown on the paddies stuck to the snail's skin, killing the pest slowly. To keep rats away from the rice seedlings, a plot of their preferred food, cassava, was planted along the paddy. Additionally, a large net was built to catch destructive pests. Planting tolerant varieties and using organic fertilizer further reduced pest pressure. Ducks were also raised on the farm to eliminate pests.

Table 1. Expenses related to rice cultivation (in Philippine Pesos)

Input	IRRI var.	MASIPAG varieties			
	1992	1994	1995	1996	1998
1 st plowing - 6 days	300	300	400	420	470
Harrowing - 1 day	50	50	70	80	-
Brushing of paddies	200	200	300	320	-
2 nd plowing - 3 days	300	420	420	-	-
2 nd harrowing - 3 days	150	150	280	-	-
Rent for hand tractor	-	-	-	1200	1300
Pulling of seedlings	400	240	480	500	500
Transplanting	600	-	350	500	-
Fertilizers (5 bags)	1000	-	-	-	-
Pesticides (1 liter)	300	-	-	-	-
Carabao manure	-	200	-	-	-
Weeding	200	-	-	-	-
Brushing of paddies	150	50	-	-	-
Seeds	1200	-	-	-	-
Labour - 12 days	-	-	-	-	-
Food	300	300	300	300	300
Total	5150	1910	2600	3320	2570

Table 2. Income from rice cultivation (in Philippine Pesos)

1992	63 ¹ cavans x P250.00 ²	=	15 750
	Less expenses ³	-	5 150
	Earnings		10 600
1994	60 ¹ cavans x P280.00 ²	=	16 800
	Less expenses ³	-	1 910
	Earnings		14 890
1995	93 ¹ cavans x P315.00 ²	=	29 295
	Less expenses ³	-	2 600
	Earnings		25 575
1996	120 ¹ cavans x P315.00 ²	=	37 800
	Less expenses ³	-	3 320
	Earnings		34 480
1998	108 ¹ cavans x P350.00 ²	=	37 800
	Less expenses ³	-	2 570
	Earnings		35 230

¹ Gross production less costs of threshing and harvesting

² Buying price per cavan

³ For details refer to Table 1

(1 cavan = 40 kg).

(100 Philippine Pesos = US\$1.84, June 2005)

The soil was improved continuously by adding organic matter. Rice straw was never burned but was always allowed to decompose. In addition neem tree, *Gliricidia sepium* and *macabuhay* leaves, water buffalo manure, soap and water were combined to form a homemade organic foliar fertilizer which was applied to infertile parts of the rice paddies and to the vegetable crops. The water buffaloes' shed was moved and placed next to a major canal so that during the rainy season decomposed dung and urine would flow naturally along the canals into the rainfed rice paddies. Dolpo also realized the importance of a fishpond for additional nutrients and in 1995 he constructed one next to his duck pen.

Planting distance and rice seedling transplantation were also modified on the Oray farm. The planting distance was increased and the number of seedlings per hill decreased from four to five seedlings per hill to only one or two. As a result there were more productive tillers per hill and higher numbers of grains per panicle.

The rice paddies were drained and flooded whenever possible. Intermittent flooding allows the root systems to breath and encourages growth. Dolpo noticed that intermittent flooding helped create a harsher microclimate, making plants less susceptible to pest infestations.

In addition, rice seedlings were transplanted after 25 to 30 days instead of the usual 15 to 20 days, when they were sturdy enough to withstand snail attacks. The more developed seedlings also have a head start over the weeds which Dolpo controlled mainly by flooding.

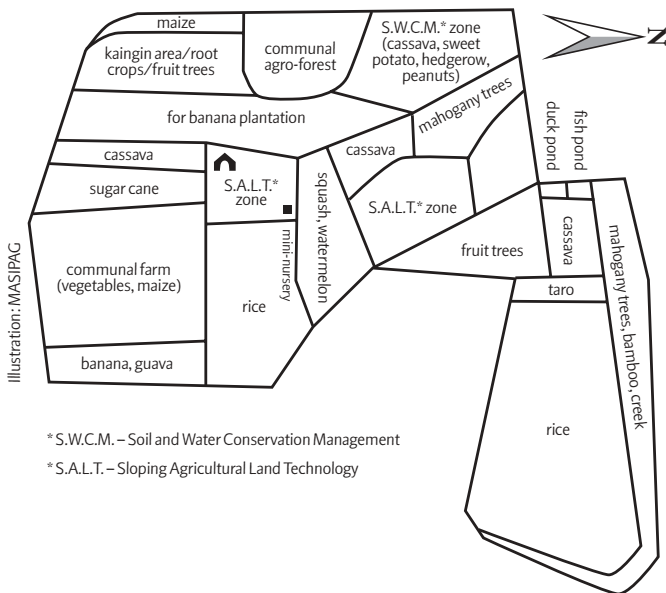
Even the most infertile or vacant lots of Dolpo's farm were incorporated into his development plan. These areas were kept under long fallow to enable beneficial insects to multiply in his farm. The previously slash-and-burned area of the farm was planted with different commercial and fruit trees, root crops and some legumes. Weeded grasses were placed on top of large rocks to decompose while others were used as mulch to maintain soil moisture.

Maintaining these developments was not always easy. Dolpo realized he needed to spend more time in his fields so he could observe the dynamics of his farm's ecology. However, it was a struggle to manage his own farm duties and conduct training while also maintaining the communal farm and training centre.

Risk management

Despite its diversity, the farm was seriously hit by drought caused by *El Niño* in 1997. Many trees died including jackfruits, citrus, rambutan, *marang*, *lanzones*, apple guavas, *biliriba*, star apple, coffee, and others. Hardest hit were those trees growing on the moderate slopes with shallow soil. In 1998, there was too much water and the *La Niña* typhoon destroyed his fishpond. That year the family also suffered medical problems and the huge medical bills forced them to sell their two working water buffaloes, three pigs and some goats. Dolpo was tempted to sell their land and to move to an irrigated lowland farm in Hinobanan. However, his family preferred to stay put.

The family is now focusing their efforts on making the farm more resistant to periods of drought, for example by planting the most drought-resistant species and locating the fruit trees in areas with deep soil, where they have a greater chance of surviving severe drought. Vegetable cultivation has also been modified to include more drought-tolerant species and the time of planting has been altered to optimize crop survival.



Present layout of Oray's farm.

The plant nursery is carefully maintained because it serves as a secure source of planting materials. Even during the long seven-month drought in November 2004, the family made sure it had seedlings of vegetables, fruit trees and forest trees ready. Velvet beans were multiplied and will be used as a green manure crop, cover crop, and fodder.

The family has again bought two water buffaloes and two cows and they continue to rear goats, a sow, several chickens and a pair of turkeys.

The farm today

The Oray family maintains the farm lay-out they designed in 1998 and work continuously to improve crop rotation and nutrient flow and recycling. After ten years of continuously practicing organic diversified integrated farming, they notice a definite improvement in soil fertility.

Lessons

Several key factors enabled Dolpo to succeed in his efforts to convert his farm and develop it into an integrated and diversified system. His own experience combined with the knowledge he acquired from “formal training” were essential in helping him decide how best to manage his farm. He also was able to access land, the basic element in the development of food security.

The mere planting of various crops is not enough for farm diversification. It is also important to develop nutrient cycling on the farm, and alternative pest management. MASIPAG's *Diversified Integrated Farming System* strategy was helpful in guiding this process. DIFS is a family affair where every member has his or her own stake in the process. It brings back the family's control over the entire production process. Though time consuming and labour intensive, DIFS is inexpensive and can work without government support.

Dolpo's experience also highlights the importance of a social network as a support system. Dolpo stays actively involved in social activities, giving advice and training but at the same time receiving valuable support. The visits by scientists and farmers for exchanging ideas reinforced his farm conversion efforts. Dolpo admits that it is hard to get rid of the “modern” agricultural system that has been embraced in such a short span of time: ‘The hardest thing to contour is the mindset’. Everything should start with a right attitude. Fortunately, the Oray's farm provides a living representation of such an attitude.

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This article is based on a case study carried out by the authors on behalf of MASIPAG: “Transforming the upland through a diversified and integrated farming system: the case of Rodolfo Oray. October 2001”.

The Oray family analyzing their farm layout.

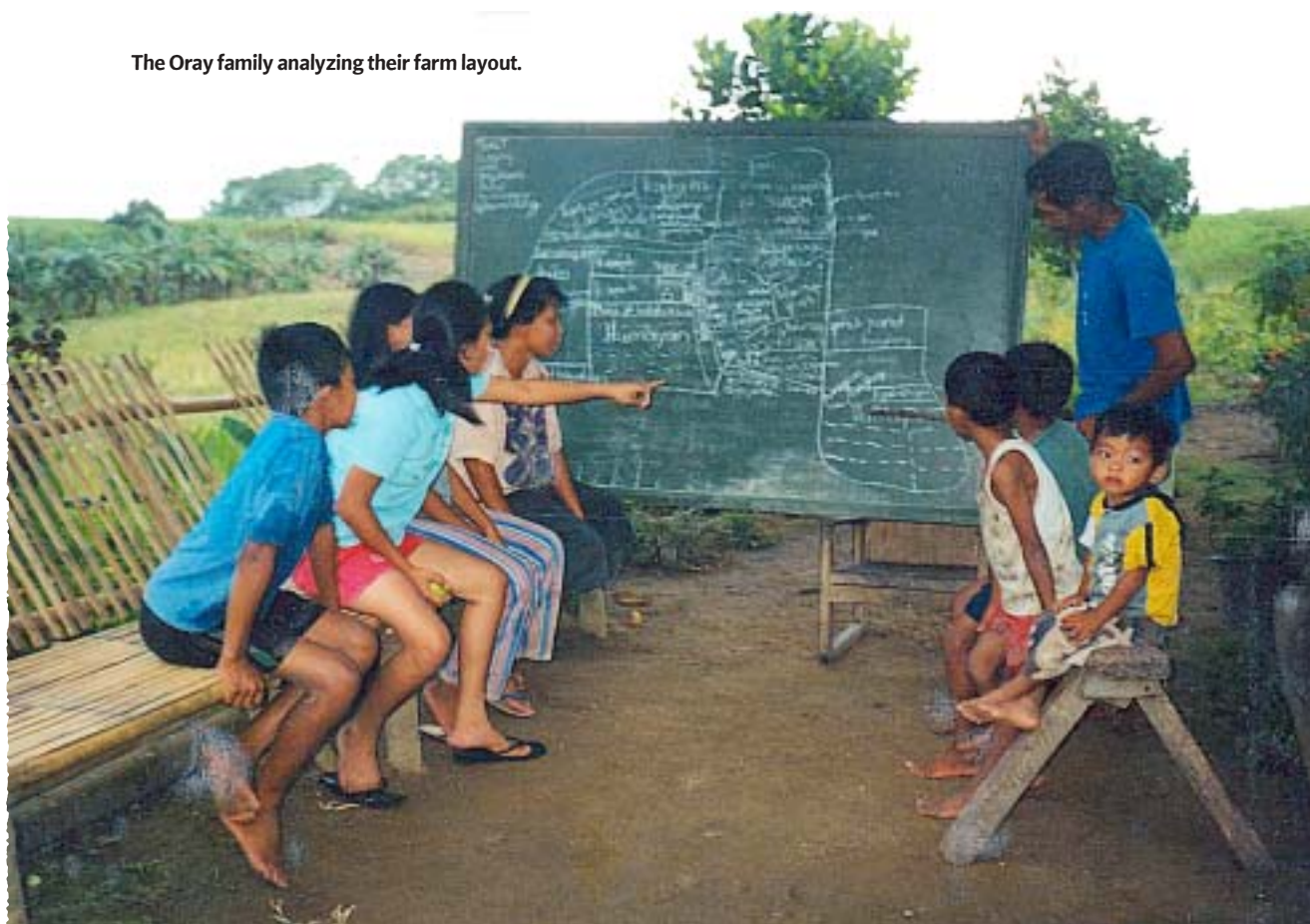


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