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Mixed Farming in Chiapas, Mexico

Our planet has become a world with food insecurity, a world with people dying of hunger every minute. Fortunately, nowadays there are people who worry about this problem and who are working for a solution.

Mexico is one of the countries with food insecurity, and although it has enormous areas for agricultural production, they are not exploited sufficiently or properly. That is why recently there have been interesting proposals to change this and increase the production in this country.

Mixed farming is one idea that to me is most interesting and feasible to help solve our present day farming crisis. Throughout the development of this essay, I give detailed explanation and substantiation regarding mixed farming. But briefly put, it involves the use of more than one element, at the same time in a small space for production, and, in the modality that I propose for the state of Chiapas, more than four elements work with each other to produce multiple products. The main idea of this proposal is to combine agriculture with aquaculture in order to obtain mutual benefits from the characteristics of each kind of culture. In simple terms, agriculture is growing plants and aquaculture is breeding fish. Ideally, this kind of mixed farming implies creating a suitable habitat for each type of culture, while fostering their interaction to create a single and sustainable mini-ecosystem that operates quite naturally, easily, economically, and with as little external input as possible. The aim is to obtain fish and plant produce for consumption by the farmers and their community as well as for trading with it externally.

Mixed farming of this type has many advantages and can be a great contributor to national and worldwide food security.

Situation in the world

Nowadays the world has many problems, but one of the most important is the way we are using up our natural resources. A lot of people are dying because of lack of water and food. Even though many institutions are already doing something about this situation with transgenic food and other new ideas, there is still a long way to go.

35 million people die of hunger in the entire world each year. In the Americas 52.4 million people suffer lack of food, and Mexico is one of the countries that has not done too much to reverse this number. (ADN.es)

Mexican situation

Mexican agriculturists confront many obstacles in order to obtain access, individually, to institutional agricultural services. Their objectives are to acquire farming land and tools to maintain it. One technique that helps to overcome adverse situations is mixed farming, which can help agriculture survive. The idea is to make maximum use of space with little resources, and with systems that make a more efficient use of physical and biological factors, such as water, light, nutrients, space, and time in order to satisfy production, preserve the environment, and conserve the ground by increasing the use of organic material and the use of available resources of the region.

Mixed Farming

The large variety of existing mixed farming reflects the diversity of the crops and of the techniques used by the world's farmers in order to satisfy the necessities of food, dress, fuel, medicines, construction materials, forage and money. Mixed farming crops can be planted in combinations of 2 crop rows, up to 12 interspersed crops. Their components can be planted at the same time or at a different time. This can be either positive by stimulation or negative by becoming inhibited. (FAO)

The use of mixed farming represents an important part in the world's agricultural picture. It occupies 80% of the planted area in occidental Africa. In Asia it is very common with the use of corn, rice, sorghum, millet, and wheat. It also occupies an important part in the tropical Latin American areas, more than 40% in yucca, 60% in corn, and 80% in beans. These crops are combined with each other or with other crops. (Altieri)

One of the main reasons that farmers adopted mixed farming is that you can obtain a bigger yield than with single crop farming, which means the use of only one product per season and focused on only one means of production, instead of using the space for different purposes. This increase in the use of the ground becomes very useful in places where there is little space, because of socioeconomic conditions, also in places where production is related to the amount of ground that can be cleaned, prepared, and weeded in little time. Another advantage of the use of mixed farming is that it may or may not use fertilizers. Even though mixed farming has sustainability benefits, farmers still have to watch for erosion, care for the ground's fertility, and cut the weeds that may appear. (Altieri)

The net economic profitability of mixed farming can be higher than that of single crop farming in equivalent areas. If one of the components of mixed farming fails, you can continue with the other components until the first one can develop again. Mixed farming compared with single crop farming captures more resources and transforms them, doing the work faster; also, as a result, it complements the use of the resources, facilitates the production between species and changes the distribution of resources. If the resources are species with special root complementary patterns, they can better absorb the nutrients of the ground, especially the ones that are motionless such as phosphorus due to mineralization. (Altieri)

But it is important to mention that heavy metals can be present in animal dung (Zn and Cu) because of the use of certain components as the basis of the animal's diet to prevent some diseases. Heavy metals are found also in the products used for disinfecting the facilities. (Calderón)

Mixed farming can manifest changes in the participation of resources in such ways that the greatest percentages of the total of nutrients that are in the crop section of the field can be absorbed by the plants in photosynthesis, which provide a bigger benefit to the farmer.

Mixed farming that includes corn-bean-pumpkin has been the most productive system, especially in Chiapas and all over Latin-America. It is based on the maximum use of land where farmers only possess little plots. It yields 218% of the production for every hectare, which means that it is 1013% more profitable than single crop farming. (A.Gutierrez-Martinez)

Aquaculture in mixed farming

On the other hand, aquaculture represents a series of advantages over other activities. The production obtained in each area's unit of water is greater than the ones that are obtained on the ground because aquatic organisms are cold blooded and do not waste energy in maintaining their body temperature, so they are more efficient transforming food. Because their body density is almost equal to that of water, they use their energy for growing instead of using it for physical support. Aquaculture does not need special fertile ground. It is an alternative to maintain the supply of fish products. It

permits the secondary use of water bodies, such as reservoirs, dams, and lakes. It diversifies and involves traditional production lines of farms, such as fattening of pigs, ducks and other land animals. The pond's water, rich in nutrients, can be used as fertilizer and to water the crops, vegetables, pasturelands and fruits. (Ariza)

A hatchery is an installation where fish eggs can breed. Efficient fish breeding in ponds requires a special preparation of the hatcheries in order to receive the spawn and larvae. The ideal size for it is about 0, 02, or 05 ha with a depth of 1 to 1.5 meters. In order to prepare the pond, first remove all the aquatic weeds, then drain and dry the pond. After that, apply 5-6 kg. of lime/200 m², which helps release the available nutrient elements and remove the organisms of the pond. Then, in order to determine if the pond's food organism development is enough to feed the little fish, the easiest way to test it is by filtering 50 liters of water through a thin filter net. (FAO)

When it is time to populate the pond, apply 80-100 gr. of insecticide, at least 20 to 24 hours before settling, in order to kill all the aquatic insects, then enter 60000-70000 larvae that is 4-5 days-old. Before introducing the litter in a new environment, it is important that the temperature inside the bag be approximately the same as the one of the pond. To achieve this, put the bags close to the pond for 10 to 15 min. and then release them little by little. (FAO)

As to feeding, it is difficult to maintain a high level of natural food for the little fish, so we require supplementary food. Also, a good fertilizer is needed, in order to maintain a good level of natural organisms for feeding in the pond. When the little fish become older, it is advisable to check if there is extra weed in the pond every day. If there is, the supply of supplementary food should be stopped, and all fauna that is not convenient removed. (FAO)

Budget according to "FAO" for the production of a little pond of fish.

Costs	
Drain/refill or to poison the pond	75 USD
Lime (5 kg)	25 USD
Cattle Dung (200 kg)	100 USD
Urea 1,75 kg and triple superphosphate 2 kg	20 USD
Dipterex 0,2 kg	80 USD
60 000 Carp larvae	600 USD
Supplement food 20 kg of mustard sandwiches	180 USD
1 kg of rice bran or wheat and 4 kg of fish flour	
Use of contacts, work force and others	400 USD
Total	1 480 USD
Incomes of the sale of 30 000 US \$(3,5-4,5 cm) little fish/young	3 000 USD
Credit	1 520 USD

1992: 1USD

(FAO)

An advantage of both kinds of mixed farming is that you can use a main species plus others, so the first can be incumbent and, it will be better than a species used in single crop farming. The use of mixed farming was started a long time ago, not only for food purposes, but for ornamental uses. As we can see, mixed farming poses countless possibilities in terms of production.

Carp, due to its fast adaptation to different conditions regarding its habitat, is a very profitable fish. It is distributed all around the world, especially in places close to the sea. When they are small fish, they have to be taken care of, as any other species, with appropriate treatment and protection. They should be fed with food rich in carbon hydrates, which combined with the reciprocal action of the fertilizer, the food, and the sowing rate will give a better growth and a better yield. (FAO)

Cornalito is a thin large and somewhat compressed fish. This fish prefers to live at the bottom, especially if there is sand or if there is a place where it can hide. It prefers to spawn on the surface in order to let the eggs adhere to each other with a special thread. (pescabaires)

Catfish is a very important fish for Mexico and other countries for sport fishing. Its body is flat with gray and blue colors and with a touch of silver and dark spots. Its mouth has two chins and two whiskers, which are the main physical characteristics of this fish. It uses its whiskers to select the food it is going to eat. It lives in clear water with vegetation at the bottom or at the surface, but not in excess. Most of the time it is a nocturnal omnivorous species. It can also eat vegetable and fruit waste. One characteristic that is really useful is that it is an incredible good food complement because 250g. provide 85% of the proteins needed by children and 65%, by teenagers. In this species, the male is the one that takes care of the nest, digging in the floor between rocks and logs. While the female spawns, the male inseminates the eggs and takes care of them airing them with its pectoral fin for 5-10 days. This depends on the atmosphere's temperature: it cannot be less than 69.8 °F. During fattening, it is advisable to provide the following cares: separate the fish in different ponds in order to prevent cannibalism; use a different sized food for each different size of fish; maintain a strict cleanliness in all the areas; watch that the water flow is constant and suitable. Also, take note of all the activities and information regarding the organism. (Acuacultura)

It is recommended to use ensiled pig manure as both, food and an organic fertilizer, because as it was proved in an experiment with common Carp in Mexico, it reduces fish mortality, it supplies a great deal of proteins and nutrients to the water and to the fish because of the organisms that fed from the pig feces. (Javier Gonzalez Yañes)

I propose to increase the use of mixed farming by raising young fish in Chiapas in order to improve and enrich agriculture and aquaculture. The fish to be used are common carp (*Cyprinus Carpio*), Cornalito (*Austroatherina Incisa*), and Catfish. Then use the water for watering the crops, in which there will be corn, beans, and pumpkin. Also, it is advisable to plant a coffee tree for two reasons, to sell and as fertilizer for the food and the fish so that the water of the pond will be also useful to water the food crops.

Conclusion

My proposal of using mixed farming is not a dream that may not come true. It is a reality in many countries, and therefore it is possible to apply the idea in Chiapas, it is convenient because it is an extremely productive farming technique, and it is sustainable because it reduces dependency on external supplies. Moreover, it is beneficial to the environment because it lowers to a minimum the exposure of water and soil to agrochemical products. On the other hand, it is economically feasible and profitable because it is not an expensive risk, and it protects the basis of local natural resources for agricultural support. We must learn to take advantage of mixed farming techniques, and it is important to show people how they can make the best use of their land.

This worldwide food scarcity situation must be dealt with now and by all of us. Mixed farming is suitable for farmers with enormous lands as well as by those with tiny plots, and it is suitable for many kinds of soils, lands, and terrains. Chiapas is tropical and it can work perfectly well there. Mixed farming can produce food for local consumption and for supplying other parts of the country as well as other countries. Perhaps it is not a complete solution to food insecurity, but what is?

Bibliography

A.Gutierrez-Martinez, C.E.Aguilar Jimenez, J. Galdamez Galdamez, Mendoza-Perez y F.B. Martinez Aguilar. «Impacto Socioeconomico de los Sistemas de Policultivos Maíz-Frijol-Calabaza en la Frailesca, Chiapas.» 16-17 October 2007. 31 August 2009 <<http://www.indirural.ual.es/descargas/docDescargas/2-3.pdf>>.

Acuicultura, Biol. Alfredo Martinez Real Director de. Cultivo de Bagre. October 2006. 1 september 2009 <<http://www.edomex.gob.mx/desarrolloagropecuario/docs/pdf/Bagre.pdf>>.

ADN.es. ADN.es. 16 October 2007. 21 August 2009 <<http://www.adn.es/ciudadanos/20071015/NWS-2241-dia-alimentacion-onu-muertos-hambre.html>>.

Altieri, Miguel A. «Agroecologia:bases cientificas para una agricultura sustentable.» 1999. 28 August 2009 <[http://www.rap-al.org/articulos_files/AGROECOLOGIA1\[1\].pdf](http://www.rap-al.org/articulos_files/AGROECOLOGIA1[1].pdf)>.

Ariza, Salazar. Aquila 2 Documento de Campo no. 11 . Mexico, D.F., 2000.

Calderón, Ma. Pilar Bernal. «Fertilidad y Contaminacion de los Suelos Agrícolas. Aplicación al cultivo de la vida.» 1990. 5 September 2009 <http://www.haro.org/pdf/resumen_bernal.pdf>.

FAO. FOA Documento Tecnico de Pesca 407: Agro-acuicultura integrada . 2004. 31 August 2009 <<http://www.fao.org/DOCREP/006/Y1187S/y1187s0a.htm#TopOfPage>>.

«Programa de la Naciones Unidas para el desarrollo y organizacion de las Naciones Unidas para la Agricultura y la Alimentacion.» 1978. 27 August 2009

Javier Gonzalez Yañes, Ana Auró de Ocampo, Vicent Anislao Tolentino. «Evaluation of the common carp (Cyprinus carpio, var. communis) growth fed when ensiled pig feces.» Veterinaria México (2002).

<http://www.fao.org/docrep/15902s/15902s0b.htm#10.1_antecedentes>.

pescabaires. pescabaires.com. 3 September 2009

<http://www.pescabaires.com/index.php?option=com_content&task=view&id=200&Itemid=77>.