Farmlands for Biodiversity Education

I live on a farm and have been using farmlands in biodiversity education since 2010, so I think they are valuable. What about you, do you use farmlands for biodiversity education? I suspect you might think there are better subjects for biodiversity education, so they are likely to have a 'low apparent value'. However, with issues of food security expected to grow, the living things in farmlands should have a place in biodiversity education.

'Farmlands' is my shorthand for agricultural ecosystems. Do you consider farmlands to be ecosystems? (See '*Are farmlands ecosystems?'* box for discussion on this) How often are farm products used to teach food chains? So, let's explore farmlands for biodiversity education for use with children-rural or urban!

Farmlands images

My farmlands lie just out my window, but what is your concept of farmlands like? Please, take a minute. Write down, or draw, what 'farmlands' looks like to you. Why, because it identifies the base on which to build ideas about using farmlands for biodiversity education.

Was a minute long enough? If so, you might have only a single image come to mind; perhaps like one of the views in the group of photos on the next page. That's ok.

If you didn't have enough time, was it because you had more images to process? Perhaps images of different parts of farmlands? (e.g. the top row in the photo group next page shows three views of Wimmera farmlands) or the different seasons on a particular farmland? Or different types of farmlands from this state, this country or another country? (eg in the photos below, the bottom row is Swiss farmlands)

Regardless of the diversity of images that 'farmlands' conjures up for you, they should have these five spheres, or major parts:

- air above, (atmosphere)
- land below, (lithosphere)

Are Farmlands Ecosystems?

The simplest farmland food chain, say grass to sheep, or seed to bird, needs soil, rain, bees, trees, etc to support it. At any scale, for any defined farmland environment, living things could be identified and interactions described between them air, land, water, humans and their infrastructure. Farmlands are ecosystems.

Are farmlands a recognized ecosystem?

On a global level, yes. Moyers in his series *Earth on Edge* (2001) reported the place of agriculture in the world's top five ecosystems:

"In 1999, an international group of more than 70 scientists analyzed the condition of the five ecosystems on which all life most heavily depends— freshwater, agriculture, forests, grasslands, and coastal ecosystems."

This report also contains a definition of the term 'agro-ecosystem' in quantifiable terms in its glossary:

*"**Agro-ecosystem**: those areas where at least 30% of the land is used for cropland or highly managed pastures"*

What else might be needed to confirm farmlands as an ecosystem? The ecosystem functions performed by the interactions, are likely to be called 'services', using the language of valuing ecosystems.

The Birchip Cropping Group's Fact Sheet1 (BCG, 2007) listed ecosystem services provided by patches of remnant vegetation across the Wimmera-Mallee Farmland Ecosystem as:

- soil formation and stabilisation,
- nutrient cycling and
- water infiltration;
- shelter belts

contributing to the health of individual farmlands and the Wimmera-Mallee farmlands generally. It was taken as given that they also functioned to give living conditions for the native vegetation species common to all farms.

My 'Farmlands' ecosystem definition

Following from this and my discussion under 'What should biodiversity education be doing?', my term '**farmlands**' denotes an **ecosystem** where the community of living things in a particular area of land has at least 30% used for farm production. Its farm, native and introduced species can be, but may not yet be fully, identified, as can the different spheres of non-living things and the infrastructure and activities by humans. All of these interact and function to create produce of use to humans and the continued existence of remnants of the original extended natural ecosystem.
This can be at a property, regional or global scale.

- water (hydrosphere) for things to grow, not necessarily visible
- living things (biosphere) – probably crops and/or stock, and maybe other plants or creatures
- and what man has added to manage the farmlands, (infrastructure) eg fences, buildings.

These are the main parts of an environment, the parts between which interactions flow in an ecosystem and on which biodiversity is built. A list of many features of these spheres which can be found on farmlands, is at *What's in an environment?* (Clark, 2013).

Look for these spheres in the photos below.

Now, look for what else is common in these images of farmlands? Did you notice trees and grasses? Yes, they are in all. Did you include trees especially in your image(s) of farmlands? If not, there are very few places in my experience that do not have trees in farmlands, so perhaps your concept of farmlands only covers the 'paddocks' where grasses dominate? However, farmlands as an ecosystem is the whole environment on which a farm is located, from the paddocks, along and over its fence-lines, through its remnant vegetation, water supply areas, road reserves, and farmhouse gardens. Trees are found through much of these and so important for biodiversity.

So a more complete image of 'farmlands' would have living things beyond crops and stocks:

- Plants – native and introduced, trees, bushes, grasses, garden plants, … and the weeds!
- Creatures – native and introduced, includes birds, mammals, insects …. And the pests!.
- Lichen, mosses, fungi

Valuing farmlands ecosystems

Now let's also consider the photos for the issue of valuing ecosystems. What are the high and low value ecosystems shown here? On what did you judge this? Is it money to be earned, recreational value, number of people that can be fed from the food, amount of native trees, etc?

In the first row (Wimmera), the sheep under the Black Box trees make a higher valued ecosystem for their food value than do the horses under the Buloke trees, which would make a higher valued ecosystem for their recreational worth. The money that will be earned from the cropped paddock will make this higher in dollar value still, but lower in native plant value than the other two.

What about the Swiss row below it? Are farmlands with cows on mountain slopes eating grass and wildflowers between remnant forest of greater value than vineyards where little forest remains? Are the flat valley floors growing fodder to keep stock alive through winter of higher economic value?

Apparent values in biodiversity education would seem to me to run the danger that they

are just used for including or excluding an ecosystem. I would expect them to generate a greater value in promoting discussion and understanding of how humans interact with and using the environment and ecosystem, such as suggested for the photos above.

Basic Concepts of farmlands biodiversity

Where to start with farmlands? I'll assume students have had some local biodiversity education and are sensitized to biodiversity and its concepts. So if there was a way to get students out to experience a farm, that's where I'd start, e.g. visit the Collingwood Children's Farm.

But that may not be possible, so use farmlands photos, e.g. the one at right (from northern Tasmania). Make a sketch of it to show its parts as a scientific record, not art. When finished, describe the ecosystem of this farmland by identifying its spheres as a checklist that the whole environment has been covered. Go from the big features to the small. Detailed instructions for this can be found at http://enviroed4all.com.au/4-learning/drawing-for-recording-science/

Then discuss what else might be live here, eg a Barn Owl screeching at night! This also includes humans, perhaps shearing. Add these to the drawing and/or a list of this environment's living things.

Ask what is 'Nature' is here? Is it the same as 'living things'? Is it the same as biodiversity? Use the list of living things to discuss what might be interconnected with each other and with other parts of the ecosystem. How might interconnections work? Might there be mice in the small shed using hay bales for shelter and food, and a farm cat competing with eagles to catch and eat them? What might people do to in these interactions? What interactions might help biodiversity (eg remove pests) and so contribute to 'living in harmony with nature' here? Such questions and discussion will develop an understanding of some ways in which a farmlands ecosystem functions.

To increase this knowledge, a particular example of a farm or farming region is needed. If you can't visit one, then use the web! There are lots of farms on the web.

from Wimmera Farmlands

While most people are disconnected from farmlands, I am not. Since 2010 (International Year of Biodiversity), I have been creating resources for biodiversity education about the farmlands, out my window, where I live. Farmlands are the future for our food security.

Sharing information about Wimmera – Mallee farmlands biodiversity and ecosystems, may help others develop a better understanding of farmlands ecosystems. Some materials on my enviroed4all website are:

- The *Biodiversity on our farm* section has three parts:
  - Develop understanding of biodiversity comparing farm and forest photos (at http://enviroed4all.com.au/biodiversity-on-our-farm/whats-biodiversity/
  - Learn how to identify Black Box - an important plains tree indicating occasional flooding (at http://enviroed4all.com.au/biodiversity-on-our-farm/black-boxes/)
  - Test weed knowledge with a challenge from photo clues of one common species. (at http://enviroed4all.com.au/wp-content/uploads/2012/11/What-Plant-is-this2.pdf)
- The *4Learning* section has the *Otherways* series with biodiversity activities mainly in the
  - 2010 issues for the *IY Biodiversity,* based in gardens
  - 2012 issues for the *Australian Year of the Farmer* , based in farmlands
- The *read4Nature* project section has reviews of picture books for their;
  - Science content,
  - suggestions for activities based on them
  - and further reading.

Many of these are about farmlands. The two best I would recommend are:

- *A year on the farm* by Penny Matthews
- *Mike's Bulldozer and the Big Flood* by Nan Bosler.

Books reviewed by children from Jeparit PS (MARC library) and community members from 8 library groups of the Wimmera Regional Library Corporation are also in this section.

- For the *International Year of Family Farms*, (IYFF) I am hoping to have a website of snapshots of farms which will cover 4 aspects: farm, family, produce and how farmland is cared for, at www.familyfarms.enviroed4all.com.au

The Wimmera HUB SPP enables me to work with small rural schools. One outcome of this has been farmlands picture story books created by farmlands children. This has been part of a project under an umbrella theme of "*Sustainability and our Farmlands Environments*" whereby teachers and children explore their home farmlands and communicate a particular aspect of sustainability for farms. The books are written for the Science Talent Search competition, so have a requirement for stating their Science base - they come from local farmlands research, not books or web research. (see http://familyfarms.enviroed4all.com.au/sustainability-farmlands/ . for the project summary.)

The stories can be used in other schools to raise awareness of biodiversity issues in farmlands and to generate discussion about whether the suggested solutions are sustainable solutions. The stories do not take into account all possible ramifications from their actions, so there is food for discussion. A comprehension and discussion sheet accompanies each story book.

The 2012 set of six books cover biodiversity topics of crops, stock, native creatures and plants, pests, weeds, and dry times. They were created by St Joseph's PS Hopetoun's 2012 Senior class. They are available on the school website, downloadable free with their discussion sheets from http://www3.sjhopetoun.catholic.edu.au/sustainability--farming.html .

The 2013 set of seven books by Beulah PS cover Australian innovations in Science – knowledge and machinery – which have aided sustainability in farming through the 20th C to today. Though not focused on biodiversity, they show some of the interactions between humans and living things to enable large areas of crops to grow and feed many people. They are not yet on the web.

(If you use any of these books, the schools would love to hear back any response from you or your students.)

During my *read4Nature* project, mentioned above (Clark, 2012), it was great to find many children's books about farms. Most covered the farm paddock. Few had images of biodiversity of a farmland ecosystem.

The BCG's *Glove Box Guide to Understanding and Improving Ecosystem Function in the Wimmera-Mallee* (BCG 2007) goes the other way, but is not a story book! It assumes farm paddock knowledge, and focuses on the patches of remnant native vegetation. The biodiversity education for these patches is:

- the living things by layers: trees, shrubs, grasses, herbs, ground layer, soils
- the signs of health in each layer,
- the potential threats to each layer
- potential actions to reduce threats.

This Guide has a layout and content that is very user-friendly not just for farmers, but also schools, and the wider community. The table, summarizing it all at the end, could be used by students as an audit tool for remnant vegetation in any farmlands. It would help them discover more about complexity in a farmlands ecosystem. The principles it contains are designed to help farmers maintain and extend their remnant vegetation patches. They also help an understanding of the parts in this ecosystem that interact. This farmlands biodiversity resource is on the web (http://www.bcg.org.au/resources/BCGEcosystemFunctionProject_GloveboxGuide_UnderstandingAndImproving

EcosystemFunctionInTheWimmeraMallee_August2007.pdf) for free.

Global level

2011-2020 is the United Nations Decade of Biodiversity (UNDB). 2014 is the International Year of Family Farming (IYFF) run under the UN's Food and Agricultural Organisation (FAO) and its partner World Rural Forum (WRF). There are links between their two targets. Two of the UNDB's 20 Aichi Targets (CBD 2011) partly relate to farmlands:
7 - sustainable management of farmlands,
13- maintenance of genetic diversity.
Of the eight roles for family farming "*food security*" is expected, while the natural biodiversity realm is added by "*managing natural resources, protecting the environment, and achieving sustainable development*," (FAO 2014). The IYFF slogan (left , WRF 2014) shows this clearly, and that it can contribute to the UNDB slogan (right, CBD 2011)

FEEDING THE WORLD, CARING FOR THE EARTH

Living in harmony with nature

It would seem very appropriate to make an effort to use farmlands for biodiversity education this year! Go further than the paddock study, to detail biodiversity and how farmlands ecosystems work. Consider the humans as an integral part. Consider the biodiversity of both parts (food/fibre species and native species) under methods for sustainable management of both together in a holistic environment/ecosystem. To improve knowledge of farmlands by using them in non-farmlands schools for biodiversity education could be a valuable step towards goals of the UNDB and IYFF slogans.

The Convention of Biological Diversity's has "*Teaching Resources on Biodiversity and Agriculture"* (CBD, 2008) free from the web at http://www.cbd.int/ibd/2008/resources/teaching/ It has the following sequence:

- definition food webs,
- where food comes from,
- importance of biodiversity for the foods we consume,
- methods for growing foods,
- effects of farming on biodiversity,
- farming actions for protecting biodiversity.

Biodiversity education of farmlands ecosystems could help people to recognize the part they plan in farmlands and other ecosystems and act for interactions which improve environments, ecosystems and their biodiversity. It would provide opportunities to discover the best that humans can do to care for biodiversity, domestic and native. And yes, examples of what to do no longer!

Living in harmony with nature? Feeding the world, caring for the earth? High aspirations. But if we don't start, we won't come anywhere near achieving them. Want to give it a go? Using 'Farmlands' ecosystems for biodiversity education is a way towards this.

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