



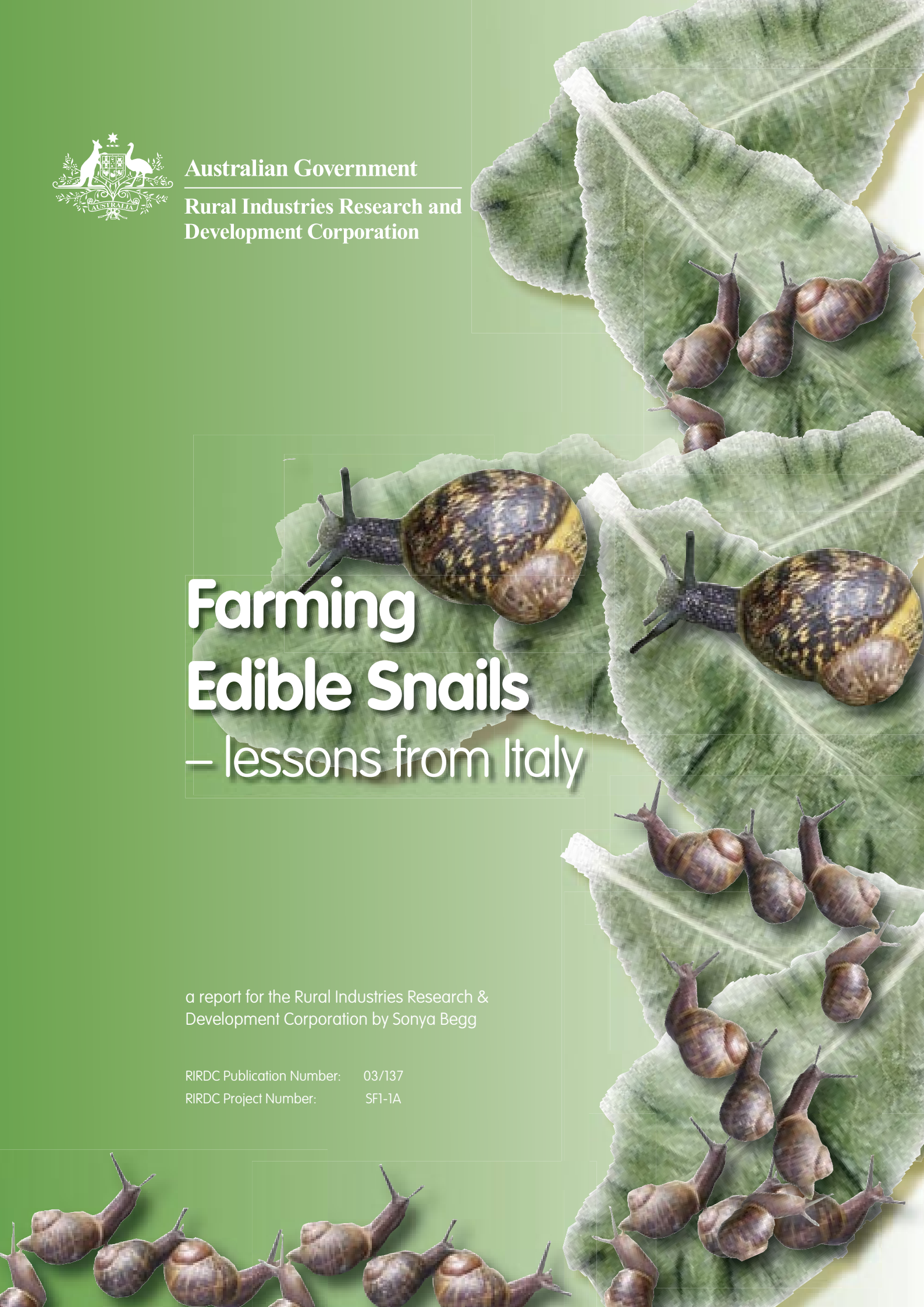
Australian Government
Rural Industries Research and
Development Corporation

Farming Edible Snails

– lessons from Italy

a report for the Rural Industries Research &
Development Corporation by Sonya Begg

RIRDC Publication Number: 03/137
RIRDC Project Number: SF1-1A



ISBN 0 642 58703 5
ISSN 1440-6845

Publication No. 03/137
Project No. SF1-1A

"Farming Edible Snails - Lessons from Italy"

The views expressed and the conclusions reached in this publication are those of the authors and not necessarily those of persons consulted. RIRDC shall not be responsible in any way whatsoever to any person who relies in whole or in part on the contents of this report.

This publication is copyright. However, RIRDC encourages wide dissemination of its research, providing the Corporation is clearly acknowledged. For any other enquiries concerning reproduction, contact the Publications Manager on phone 02 6272 3186.

In submitting this report, the researchers have agreed to RIRDC publishing this material in its edited form.

Researcher contact details

Mrs. Sonya Begg
Snail Farming Information Service
2 Sunrise Way
ORANGE NSW 2800

Ph: 02 6361 8104
Email: snails@netwit.net.au

RIRDC contact details

Dr Peter McInness
Program Manager
Joint Venture Agroforestry Program
Rural Industries Research and Development Corporation
PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4029
Fax: 02 6272 5877
Email: june.murphy@rirdc.gov.au

Printed by Union Offset Printing, Canberra
Designed and typeset by RIRDC Publications Unit
December 2003

Foreword

This booklet describing possible techniques for production of edible snails has been prepared by Sonya Begg following a visit to the International Snail Farming Institute and attendance at an International Conference of Snail Farmers in Italy. The location was selected because of the snail farming methods that have been researched for many years in that country.

Outcomes of this visit will be considered in a three year R&D project which is being supervised by Sonya at Orange, NSW, and funded partly by RIRDC. The project's objectives include an assessment of the viability of alternative methods of mass production of edible snails – the creation of a model 'pasture production' or 'free-range' system for containment and cultivation. Such a system would be an alternative to the current labour intensive and time-consuming production systems.

The decision to disseminate this booklet now is to provide information which will be considered in the development of the RIRDC project. Sonya can be contacted by Email – snails@netwit.net.au.

This report is an addition to RIRDC's diverse range of over 1000 research publications and forms part of our New Animal Products R&D program, which aims to accelerate the development of viable new animal industries.

Most of our publications are available for viewing, downloading or purchasing online through our website:

- downloads at www.rirdc.gov.au/fullreports/Index.htm
- purchases at www.rirdc.gov.au/eshop

Simon Hearn

Managing Director

Rural Industries Research and Development Corporation

Books from RIRDC

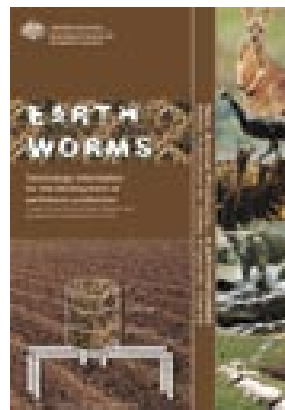


Markets for Skins & Leather from the Goat, Emu, Ostrich, Crocodile & Camel Industries

by K. MacNamara et al.

Provides Australian producers and tanneries with a clear understanding of the opportunities and market characteristics for skin and leather products from goat, emu, ostrich, crocodile and camel. The market knowledge provided here will enable businesses to better meet customer needs and identify the critical factors for successful market development. It includes an overview of the characteristics and supply capabilities for each of the skins, and of the world market in which these industries operate.

2002, 138pp, Pub. No. 02/142; \$26



Earthworms – Technology information to enable the development of earthworm production

By R.A. Dynes

Earthworm production systems involving waste management are evolving and as the industry matures there will be a need to change the marketing emphasis from “the worm as an inoculum” to “the worm as a value-added marketable product”. Very large quantities of worm products will be available if production systems are designed and managed appropriately. This project aimed to deliver technologies to underpin the development of an earthworm industry which has a range of products including ‘value-added’ worm meal products.

2003, 39pp, Pub. No. 03/085; \$21



Farmed Rabbits in Australia

By S. Eady

Examines the development of a breeding program for the meat rabbit industry using advanced genetic technologies with a strong emphasis on improving traits related to enterprise profitability. And covers the development of a breeding objective for the industry to maximise financial return, the evaluation of rabbits breeds against this objective, the design of a breeding program to improve traits of economic importance, and the delivery of this technology to the meat rabbit industry.

2002, 54pp, Pub. No. 02/144; \$21



Breeding and Growing Snails Commercially in Australia

by B. Murphy

Investigates the feasibility of establishing an economically viable and edible snail industry in Australia. The focus is directed towards the commercial production and management along with the establishment costs that will be encountered with the development of a large scale commercial snail farm. Also includes information on growing and breeding snails on a commercial level, detailing appropriate husbandry and stock control.

2000, 46pp, Pub No 00/188; \$16

How to Order

RIRDC has published over 1,000 copies of research reports on topics spanning all of our diverse programs. You can purchase these reports by:

- visiting our eshop at www.rirdc.gov.au/eshop
- by phoning 02 6272 4819
- by faxing 02 6272 5877

RIRDC also has a policy of allowing free downloads of our reports from our website at www.rirdc.gov.au



Contents

Foreword	iii
Background	vi
Role of the International Snail Farming Institute	1
Role of the National Association of Snail Farmers	2
The 32 nd Conference of International Snail Farmers	2
Potential for 'pasture production' of edible snails in Italy	3
Species used for snail production	4
Italian snail production data by species (2002)	4
Choice of site and soil structure	5
Size of site	5
Preparation of site	6
Suitable plants to grow for feeding snails	6
Perimeter fence	7
Internal fences	8
Predators	8
The seasons	9
Reproduction areas specifically for the species <i>Helix aspersa</i> .	9
Growing or fattening areas	10
Reproduction Table	10
Growing schedule	11
Hibernation	12
Production problems	12
Harvesting and purging snails for the market	12
Summary	13

Background

The information and photos in this report were gathered by the principal investigator, in Cherasco, Northern Italy in September 2003 while attending the International Snail Farming Institute and the 32nd Conference of International Snail Farmers.

Consultation was held with the Director of the International Snail Farming Institute and President of the National Association of Snail Farmers, Dr Giovanni (Gianni) Avagnina.

Through an interpreter, the role of the Institute and the Association was explained along with the fundamentals of the Italian method of 'pasture production' incorporating the concept of the biological cycle of breeding snails in a natural environment for the gourmet food trade.

Arrangements were made to attend the Conference and visit three snail farms in the Cuneo region in the Province of Piedmonte.

Farming edible snails

Role of the International Snail Farming Institute

Dr Giovanni Avagnina, a world authority on Heliciculture, founded the International Institute of Snail Farming in 1972. His most recent achievement was to establish 160 snail farms in Sardinia at the request of the Italian Government.

The Institute is a non-profit organisation and its objective is to research and develop the most efficient method for raising snails of the *Helix* family. From many years of collating data from its research and practical farming, the Institute now assists potential snail farmers to become established in the industry and offers on-going support on a contract basis.

The Institute enters into an agreement with potential growers that it will supply technical support and commercial advice on the establishment of a suitable snail growing system.

The Institute provides information to the farmer about the initial preparation of the ground and structures, schedule for growing and rotating crops using the Italian 'pasture production' (free-range) method for raising edible snails.

Advice is given on the best production and breeding systems for all *Helix* species in particular, *Helix aspersa* and *Helix Pomatia* species.



Helix aspersa Muller 1774

Other areas of expertise include advice on the most appropriate species of snail and appropriate crops or vegetation to grow in the proposed snail farm. The Institute selects and supplies the initial breeding stock and monitors reproduction and stocking rates.

The Institute enters into an agreement with the snail grower to purchase all the grower's marketable stock at the current market price and undertakes marketing of the final product through its National Marketing Service.

The snails are sold fresh, frozen, bottled and canned to restaurants and retailers. Currently the Institute has over 2,000 members and in 2002, the commercial production of snails in Italy totalled 33,000 kilograms.

Each grower who enters into a contract with the Institute is given certification and permission to brand their snail produce under the trademark name 'Lumache Italiane' (Italian Snails).



The Institute is the most important point of reference for technical assistance on snail farming in the world.



The snails are sold fresh, frozen, bottled and canned to restaurants and retailers.

The Institute also offers a franchising service with branded products for re-sale only by those people who have taken up the franchise.

The role of the National Association of Snail Farmers

The National Association of Snail Farmers commenced in Cherasco in 1978. Around fifty snail farmers across Italy founded the Association during an annual meeting that was organised by the International Snail Farming Institute.

Its aim was to develop systems and standards to improve production of snails in Italy and to coordinate promotion and marketing and to increase consumption of snails beyond being an occasional delicacy.

Snail growers using the trademark, 'Lumache Italiane' must meet the quality assurance standards of the Association that makes regular checks to ensure growers are maintaining a high standard of produce.

The 32nd Conference of International Snail Farmers

The Conference was held over two days and included the exhibition of commercial equipment and merchandise necessary for establishing a snail farm.

A formal meeting of the National Association of Snail Farmers was conducted, followed by a session devoted to potential snail farmers. The session was an introduction to the snail farming industry and emphasised the importance of the support of the Institute to snail farmers in Europe.

A review of the snail in cuisine included a visit to a restaurant for talks on the preparation of snails, followed by the official, formal luncheon that included six courses of snails prepared in different ways.

Visits to three commercial snail farms in the Cuneo region allowed viewing of working snail farms and talks with the farmers.

Food, wine and tasting of frittata de lumache and wine Rosata Lumaca was held in the Piazza del Municipio for the informal close of the Conference.

The 'Lumacheria Italiana' show room where franchising products were displayed and discussions about the products on display were held.



Potential for 'pasture production' of edible snails in Italy

During the last 30 years in Italy, snail farming has moved from a small cottage industry to a large-scale, recognised agricultural farming enterprise.

For many years in Italy and other parts of Europe, snails were collected from the wild. This activity led to diminished numbers of snails in their natural habitat, so an embargo was placed on collection of wild snails.

In Italy today, wild snails are no longer considered as a food source as stringent health regulations for consumption of food are now in place. This is necessary to protect the consumer against collected snails that may have ingested toxic plants or potentially harmful chemicals.

After years of experimentation and trials for housing and breeding, the current Italian method of raising *Helix* species of snails in open areas of 'pasture production' has proved to be less labour intensive and more cost effective than growing snails indoors or in greenhouses.

The economic benefits are realised only after the initial establishment of perimeter and internal fencing is recovered. Profitable financial return is not likely for 12-14 months.

On-going overheads are lower compared to the indoor or greenhouse production, as the main costs are only for seeds and the labour for ground preparation and sowing the vegetable crops.

Densely grown crops give adequate cover from predators and provides a nutritious food source for snails
Species used for snail production



Species used for snail production

The following list shows the different species of snail that are farmed in Italy.

- *Helix aspersa* (Müller 1774)
- *Helix pomatia* (Linnaeus, 1758)
- *Eobania vermiculata* (Rigatella) Müller 1774)
- *Helix lucorum* (Linnaeus, 1758)
- *Helix aperta* (Born, 1778)

Please Note:

The *Helix aspersa* variety is the only snail allowed for farming in Australia. The importation of other snail species is not allowed

Italian snail production data by species (2002)

Species	Kilograms produced	Percentage of total production
<i>Helix aspersa</i>	14,900	45.15
<i>Helix pomatia</i>	9,800	29.70
Rigatella	4,420	13.39
Others	3,800	11.76
Total	33,000	100

The table above, shows that *Helix aspersa* is the most suitable and easily-grown snail for farming in Italy. It is extremely adaptable to different climates and environmental conditions and its high reproductive and growth rates make it an appropriate edible species for farming.

Helix aspersa is a smaller snail than *Helix pomatia*. When sold, *Helix aspersa* measure between 25-30mm. *Helix pomatia* measure between 28-36 mm.



Please Note:

The *Helix aspersa* variety is the only snail allowed for farming in Australia. The importation of other snail species is not allowed

Please Note:

The *Helix pomatia* variety is not allowed into Australia.

Choice of site and soil structure

Snail farming in Italy is conducted in open pastures, with suitable plants grown for food and shelter. No shade covering is used.

Consideration is given to the prevailing wind when choosing a site for snail production, as strong winds will dry out the soil.

Soil analysis and disinfestation is undertaken to ensure it is suitable for growing leafy, green vegetable crops and to eliminate predatory insects and pests.

It is recommended that the soil is friable with pH 5.8 to 7.5 as highly acid soil is unsuitable for snail production. Calcium content in the soil should be around three to four percent.

The structure of the soil should be medium to light and friable. Clay soil is unsuitable for egg laying as it is usually too hard for the snails to burrow down into and can become waterlogged.

It is important that plants and snails are kept moist by the night-time dew, rain or controlled misting.

Snails move more easily when the leaves and ground are moist. They eat more and grow faster with the correct environmental conditions.

Rain and controlled irrigation is important for snail production. Good soil drainage is necessary so that water does not remain on the ground in puddles.

The site should be free of large trees as these can cause problems such as attracting predatory birds, giving too much shade for development of crops and preventing dewfall.

Size of site

Snail farms in Italy vary from size according to the category of the grower.



Cottage industry or people who grow snails in small quantities for a hobby, utilise an area of around 1000 to 2000 square metres.

People who farm snails as an alternative to another enterprise, average around 3000 to 10,000 square metres.

Large-scale commercial snail producers usually start snail production in units of 2 hectares and can build up to 30 hectares as their business increases.

Allowance is made for extra sowing areas outside the area designated for snail production for the growing of supplemental crops such as sunflowers.

Preparation of site

The site is cleared of grasses and weeds by the use of a contact herbicide. The soil is then cultivated with a rotary hoe and the perimeter fence is erected.

Fertiliser is added to the soil and chemical disinfestation of predatory insects and organisms is carried out

The area is then divided into sections for the first year's production and wooden posts are put in place to hold up the internal fences of 'Helitex' netting.

The ground is again prepared with further rotary hoeing with the addition of lime if required and the irrigation is established.

The crops are sown after the soil has been evened out and the inner fences are erected.

Finally, paths are cleared again by contact herbicide such as Roundup® between all the fences for ease of maintenance.



Suitable plants to grow for feeding snails

As the snail is vegetarian, it likes a variety of food such as vegetables and natural grain-based cereals. However feeding in 'pasture production' systems usually only includes plants that have fleshy green leaves that contain mineral salts, nitrates, and sulphates and carbonates that assist in shell building.

The plants have two roles to play in the effective production of snails—provision of food and protection from the elements—sun, heavy rain or hail.

Some of these plants include burdock, borage plantain, sorrel, chervil and sunflower. Plants that are mostly used in the Italian 'pasture production' units are beetroot, cole (horse cabbage), chicory, artichoke, radish and sunflower.

All plants are heavily hand-sown to give dense ground coverage and a variety of plants are sown according to the growing season (winter and summer crops). Timing

of sowing is important to ensure that there is always established vegetation. Rotation of growing areas is essential for optimum crop and snail production.

As soon as the plants are established, the breeder snails are selected and placed inside the 'Helitex' fence at a rate of 25 *Helix aspersa* or 20 *Helix pomatia* to the square metre. (See section on fencing for explanation of 'Helitex' fencing).

The timing for planting of summer and winter crops may differ and the type of crops grown may also differ to those grown in the central tablelands of NSW, where the RIRDC research project will be undertaken.

Perimeter fence

The outer perimeter is fenced with sheets of galvanised iron. The galvanised sheets are buried to a depth of 30-40 centimetres with supportive wooden or iron posts.

The main purpose of the perimeter is to prevent the entry of predators, especially those that burrow. It is necessary to have a cleared area between the perimeter and internal fencing. Should any snails escape from the internal fences, the cleared ground and perimeter fence will stop them from going further.

The addition of wire netting and/or an electrified wire on top of the galvanised sheets gives greater security to the snail production area.



Internal fences

The internal fences are used to separate the breeding and growing areas.

The fences are made of durable, black, weather-resistant 100% polyethylene called 'Helitex'. They have two downward facing flaps at 40 cm and 70 cm from the ground to prevent the snails from crawling out of the enclosure.

Wooden posts are placed at 3-4 metre intervals to support the 'Helitex' that is buried into the ground at least 10 cms. The area is usually from 20-45 metres long and 2-4 metres wide.



Fences can be moved if necessary, when the newborn snails are hatched in the reproductive area.

Predators

There are many predators that can cause problems to the snail producer in Italy.

These include carnivorous beetles such as carabidi, calosomidi, lampiridi and in particular stafilinids that attack and kill small snails. The beetles live in the soil and enjoy the same moist environment as the snails. Stafilinids are the worst threat to snails.

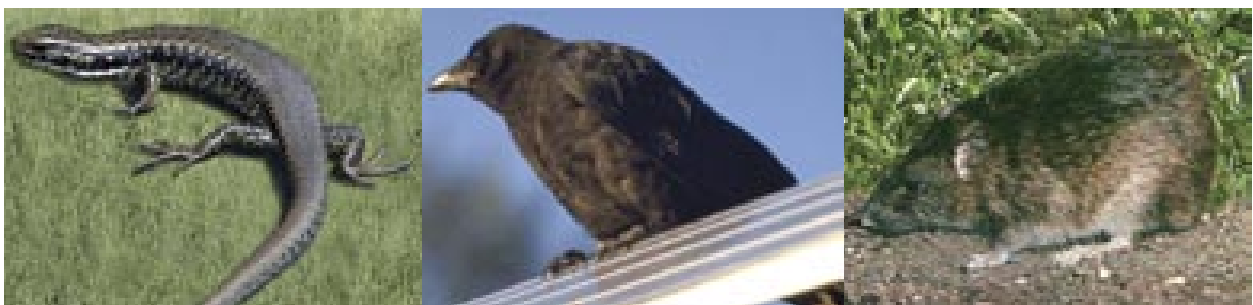
During the preparation of the site, chemical disinfestation is used primarily to eradicate these pests.

Birds such as crows and magpies eat snails. They break the shell with their beaks and eat the snail inside. Blackbirds also eat snails by picking up the snail and breaking its shell against a rock until the snail is free of the shell.

Lizards, snakes and toads enjoy a feed of snails, especially the juveniles, so the external fence must be buried in the ground to prevent the entry of these predators.

Rats eat snails, especially during winter when their food source is low.

Rabbits, hares and moles are also a problem in Italy because they will eat the crops and damage the snails by walking on them.

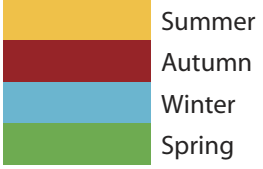


The seasons

The information in this report is based on the seasons of the northern hemisphere.

The following table shows the difference between seasons in the northern hemisphere and the southern hemisphere.

Month	Northern hemisphere	Southern hemisphere
June	Summer	Winter
July	Summer	Winter
August	Summer	Winter
September	Autumn	Spring
October	Autumn	Spring
November	Autumn	Spring
December	Winter	Summer
January	Winter	Summer
February	Winter	Summer
March	Spring	Autumn
April	Spring	Autumn
May	Spring	Autumn



Reproduction areas specifically for the species *Helix aspersa*.

Breeder snails are selected for reproduction and introduced to their new environment in early spring. They are selected for their size and quality and placed in the area chosen for reproduction that has established vegetation.

The first year's reproduction areas are stocked with 25 *Helix aspersa* to the square metre. Overcrowding will cause dwarfing, low weight gains and mortality due to build-up of slime on the ground.

The breeder snails are closely monitored for the first few days as they will try to escape and may suffer from environmental stress.

The crops grown in the reproduction area should grow no higher than 50 cm. The crops are trimmed with a motorised line trimmer to encourage new growth of leaves and enhance air to circulation.

The density rate for the second year of reproduction is lowered to 15 breeders to the square metre, as the mortality rate is not as high. The breeders have been locally bred, so they are better acclimatised to the environment and less stress is suffered.

Growing or fattening areas

After hatching, baby snails are allowed to grow to around three months of age before being transferred to growing areas that have fresh crops established. It is important that these crops are dense to give protection from the summer sun.

Crops should not grow to more than 25 cm and they are also trimmed to encourage new leaf growth and air circulation.

During the growing time, it will be necessary to supplement with cut crops and dry food when the crops become depleted.

Reproduction Table

A1 - A4

Reproduction areas

A1	Timing	Crop
April	introduce breeders	early summer
May	breeders mate and lay eggs	
June	babies hatched	

A2	Timing	Crop
May	introduce breeders	early summer
June	breeders mate and lay eggs	
July	babies hatched	

A3	Timing	Crop
Aug	Breeders transferred from A1 to continue reproduction	summer
Sept		
Oct	Babies hatched Selection of adult snails for next year's breeders Excess breeders harvested for sale	

A4	Timing	Crop
Sept	Breeders transferred from A2 to continue reproduction	late summer
Oct		
Nov	Babies hatched Selection of adult snails for next year's breeders Excess breeders harvested for sale	



Growing schedule

B1 - B4

Growing areas

Supplemental summer/winter crop	B1	Timing	Crop
	Sept	Babies transferred from A1 for growing	late summer
	Oct		
	Nov		
	B2	Timing	Crop
	Oct	Babies transferred from A2 for growing	early winter
	Nov		
	Dec	Hibernation	
	B3	Timing	Crop
	Dec	Babies transferred from A3 for growing	winter
	Jan		
	Feb		
B4	Timing	Crop	
Jan	Babies transferred from A4 for hibernation if insufficient feed available in A4	late winter	
Feb			
Mar			



Other supplemental crops rotated with the sunflowers include rapeseed, horse cabbage and cutting beet.

Snail producers have also found that it is sometimes necessary to add dry cereal feed and other vegetables like carrots and cucumbers, especially towards the end of summer and autumn.

Hibernation

In December and January in Italy, the snails' activity ceases and they close up in the shell for the winter rest.

In cold climates, autumn-bred snails are covered with a thin film of 'frost-guard' material to protect them from freezing. The 'frost-guard' material elevates the soil temperature by 5-10 degrees.

During winter the snail producer attends to maintenance and pulls down old fences, ploughs in the spent crops and prepares the soil for a new summer crops.

Production problems

Causes for failure are often due to the same problems that are seen continually in production systems in Italy. These include: Poor management, reproduction problems due to the complex biology of the snail, insufficient finance, poor ground preparation, wrong choice of crops, insufficient rotation of crops, overstocking, predators and lack of sufficient water for plants and snails.



Harvesting and purging snails for the market

Snails in Italy are harvested as soon as they reach maturity. When the lip edge of the snail becomes hard, then it has reached maturity and will not grow any bigger.

The snails are picked up weekly or when it suits the farmer, usually in autumn and spring and transferred to purging cages for seven days to rid their digestive systems of any soil or grit.



In Italy, the snails are left for a week in open cages in a cool area without food or water. The purging cages are often made of netting or wire and are built off the ground.

During this period of purging, they lose 20% of their body weight and retract into the shell but are able to remain alive in this condition for two months if kept in a cool environment of around 4-6 C.

When it is time to sell the purged snails. They are packed live into net bags (like onion bags), waxed cartons or wooden boxes for large numbers of snails.

Snails are sold in general food markets and are purchased by green grocers or restaurants.

Country food festivals are held regularly throughout Italy and snails are often a feature.

Sixty percent of live snails are distributed through fish markets.



Summary

During the last 30 years in Italy, snail farming techniques have been researched, rationalized and have finally become better structured. The need arose to streamline the industry as it was recognised that there was an increase in the consumption of snails all over the world. Better organised farming systems have led to a more efficient way of producing snails – the Italian ‘open production’ system.

With the help of the Italian Snail Farming Institute and the National Association of Snail Farmers, opportunities have opened up employment in the Italian snail farming industry.

The Institute and the Association believe that snails raised in the open environment makes the end product high in flesh quality, bigger in size and more palatable than snails that are raised in intensive indoor or greenhouse production.

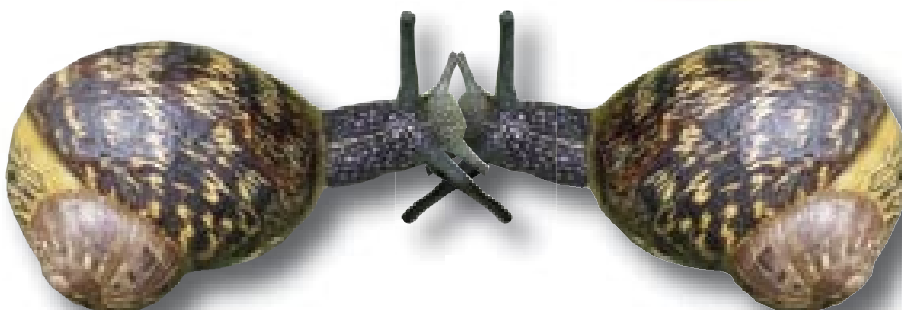
The potential for farming snails utilising the Italian ‘pasture production’ method in Australia appears to be positive but needs proving in a practical trial.

While the crops and planting time may differ, the correct rotation should be easily achieved with advice from an agronomist.

Success depends on the ability of the potential farmer to interpret the Italian production method to suit the climate and environmental factors in the area in which the farm is to be situated.

Research in Italy has shown that the number of marketable snails raised successfully from each breeder is an average of 20 snails. It takes from 10-12 months for the snails to reach market size. As long as no major problems occur during the raising and growing time, and space is not a premium, the potential for mass production of snails appears to be feasible.

The major factor for success depends on suitable environment, the growing of appropriate crops, continuous rotation and low-density stocking rates. Coupled with the attention to maintenance and control of predators, the snails benefit from completing a full biological cycle in natural environmental conditions that should result in a high quality edible snail.





Farming Edible Snails

– lessons from Italy

by Sonya Begg

RIRDC Publication Number: 03/137

RIRDC Project Number: SF1-1A

This booklet describing possible techniques for production of edible snails has been prepared by Sonya Begg following a visit to the International Snail Farming Institute and attendance at an International Conference of Snail Farmers in Italy. The location was selected because of the snail farming methods that have been researched for many years in that country.

Outcomes of this visit will be considered in a three year R&D project which is being supervised by Sonya at Orange, NSW, and funded partly by RIRDC. The project's objectives include an assessment of the viability of alternative methods of mass production of edible snails – the creation of a model 'pasture production' or 'free-range' system for containment and cultivation. Such a system would be an alternative to the current labour intensive and time-consuming production systems.

RIRDC's New Animal Products R&D Program

RIRDC's New Animal Products R&D Program aims to accelerate the development of viable new animal industries in Australia.

There are more than 40 prospective and emerging animal based industries for which RIRDC receives research proposals or enquiries regarding R&D funding. The annual value of livestock and products traded from these industries exceeds \$200 million with approximately 50 per cent traded on export markets. Funding is based on the commercialisation of native and feral animal products where enhancement of the environment and biodiversity are not threatened.

RIRDC www.rirdc.gov.au