FROGS' FARMING IN RESPONDING TO THE INCREASING DEMAND OF FROZEN FROGLEGS FROM THE EUROPEAN UNION

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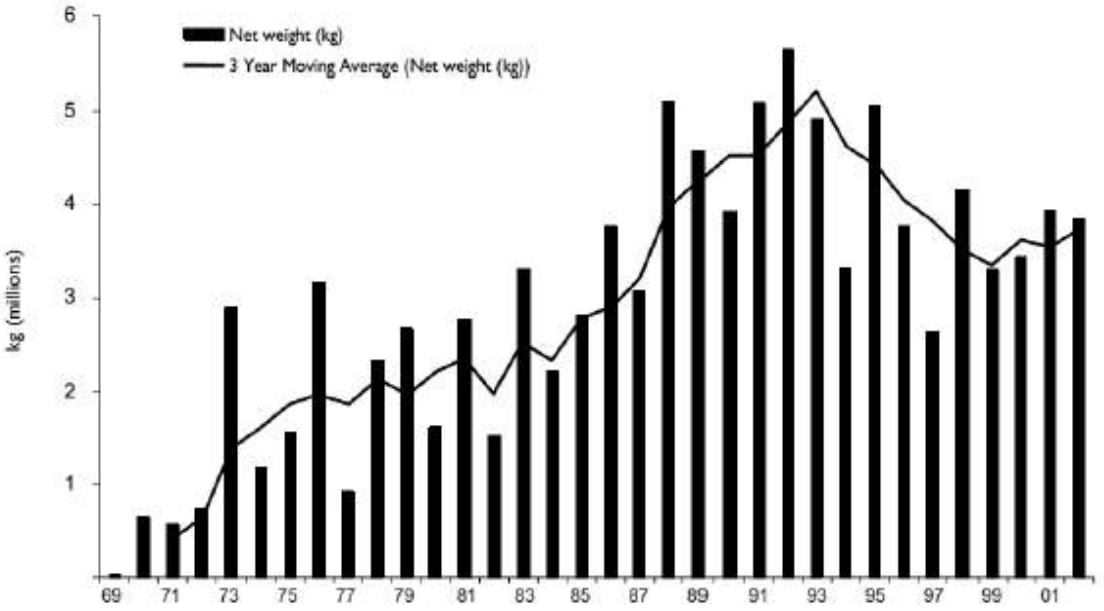
Background

Frog harvesting is now becoming amphibians threats factor beside destruction and habitat degradation, environmental contaminants, and infectious disease (Iskandar, 2018)

In many countries in Asia, Africa, and Latin America frogs are collected for subsistence or local consumption (Altherr et al, 2011).

BACKGROUND



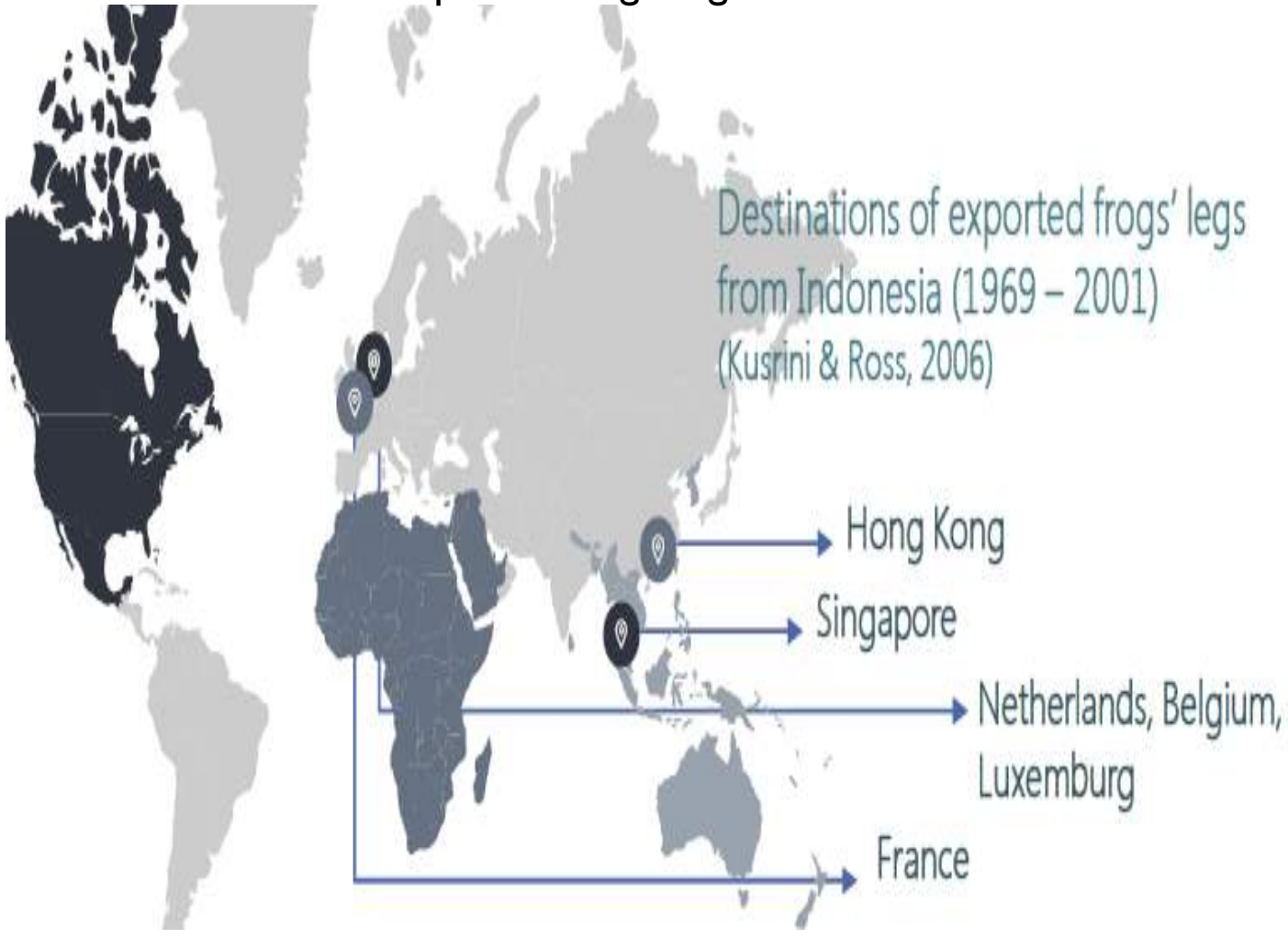
Frogs's legs exports from Indonesia in 1969-2002 (Kusrini & Alford, 2006)

In Southeast Asia, *Fejervarya cancrivora* and *Limnoncectes macrodon* are highly exploited frogs species for consumption purpose.

Indonesia is one of major exportir country of frogs' legs (Schmuck, 2000; Kusrini & Alford, 2006).

Background

Destinations of exported frogs' legs from Indonesia



- Export Number of Froglegs in Indonesia (1999 – 2002): 3,831 ton (US$ 11.593 – 15.324 million)
- Comprises *L. macrodon, F. limnocharis,* F. cancrivora, *R. catesbiana* – **mostly belonged to *F. cancrivora*,** with destination of 36 juridictions
- Europe was the major importer of Indonesian frogs' legs (83.2% of the total exported)

Natural History

Morphology

- *F.cancrivora* is medium frogs, a narrow head
- The sides of the head have small glandular warts. Parts of the flanks have glandular folds and the lower part has glandular warts.
- Almost-full webbed membrane on hind limbs
- Habitat in rice fields and mangrove forest
- Tolerant to high salinity

Reproduction and behaviour

- Reproduction season in April-August
- Preference on rice fields irrigation channels as reproduction spot
- 500-1000 produced eggs from mature female
- Hatched eggs will grow to be juvenile frogs in 45 days
- Noctural, prey insects and crabs which suitable to its mouth

Mortality factors

- Mortality level when tadpoles stage in the farm is around 10%, on metamorphosis 35 %
- Low immune system of frogs on rice fields (effect of herbicide & pesticide), predators
- Highest level of eggs production is in rainy season

Areas of Research

Mostly, *F.cancrivora* exported from Indonesia are catched from the wild

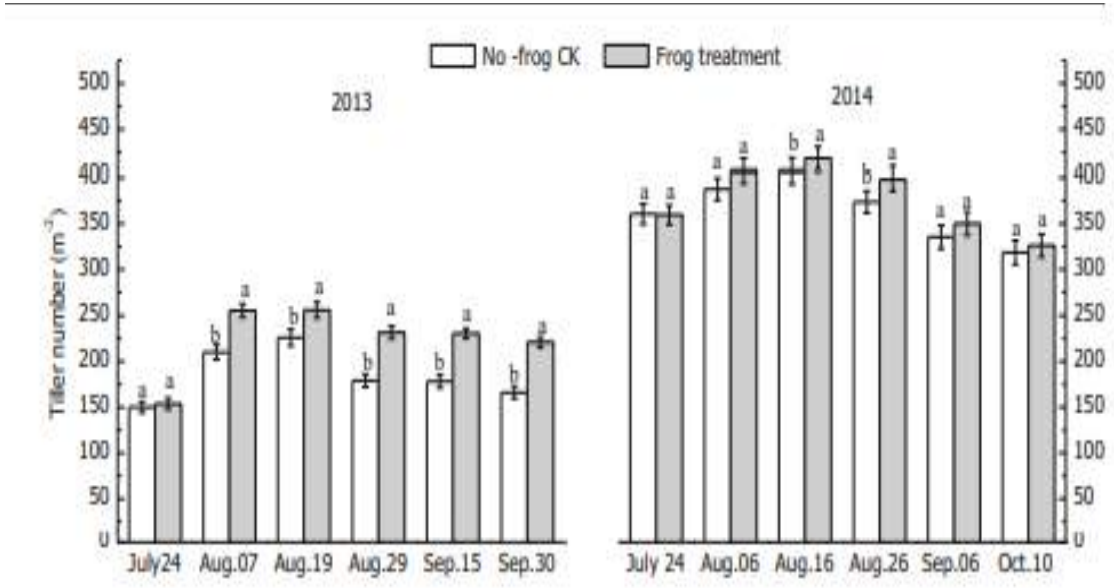
- It means an exploitation of this species from the field

Thus, to fulfill the market demand while maintaining the population of this frog is important

- Artificial reproduction of *F.cancrivora* using mina padi system
- Spreading young frogs in the rice fields

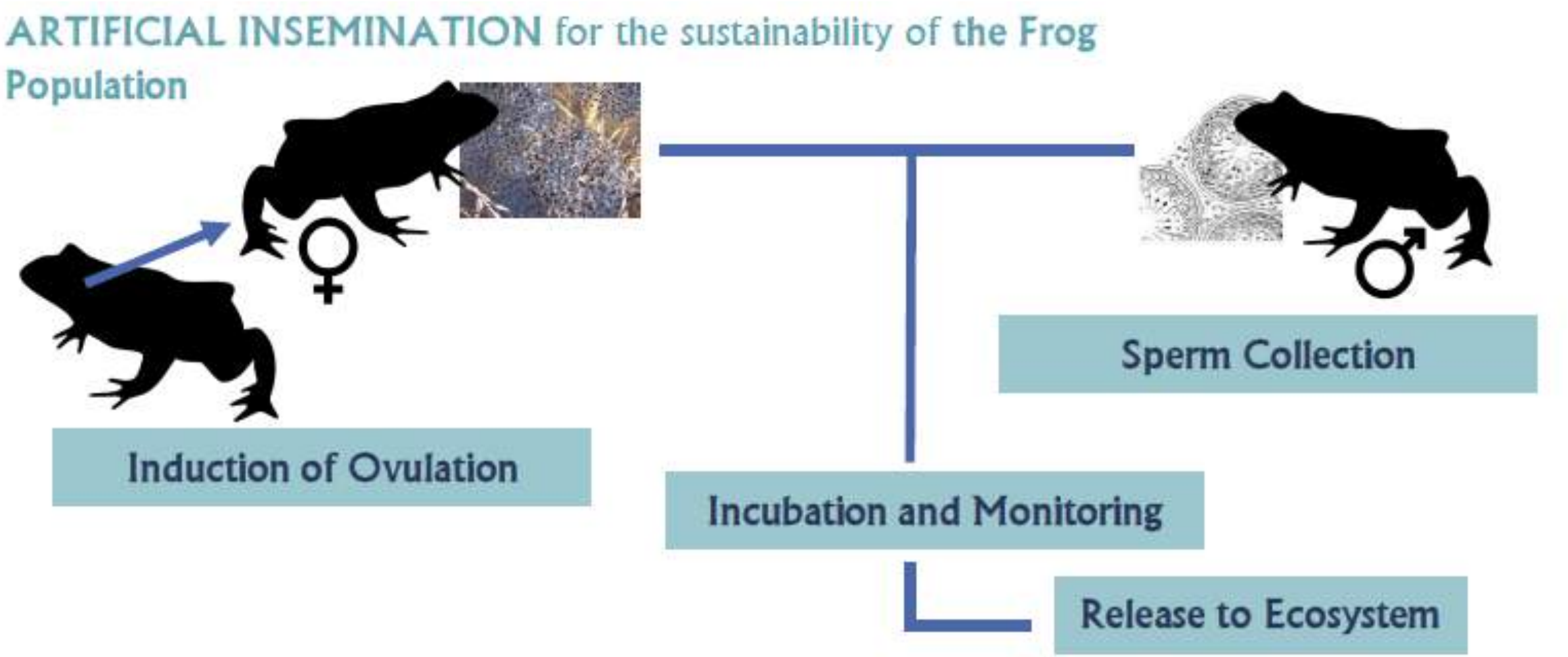
Integrated rice-frog farming

- A mode of ecological farming, is fundamental in realizing sustainable development in agriculture (Fang et al., 2019).
- Introducing frogs in the fields could reduce the populations of rice leaf rollers, stem borers, and planthoppers effectively due to frog predation, and could control rice sheath blight indirectly through reducing insects that transmit disease pathogens (Teng et al, 2015)
- Introducing frogs in the paddy fields not only showed a potential of pest and disease control but also improved soil fertility and rice growth (Teng et al, 2015)

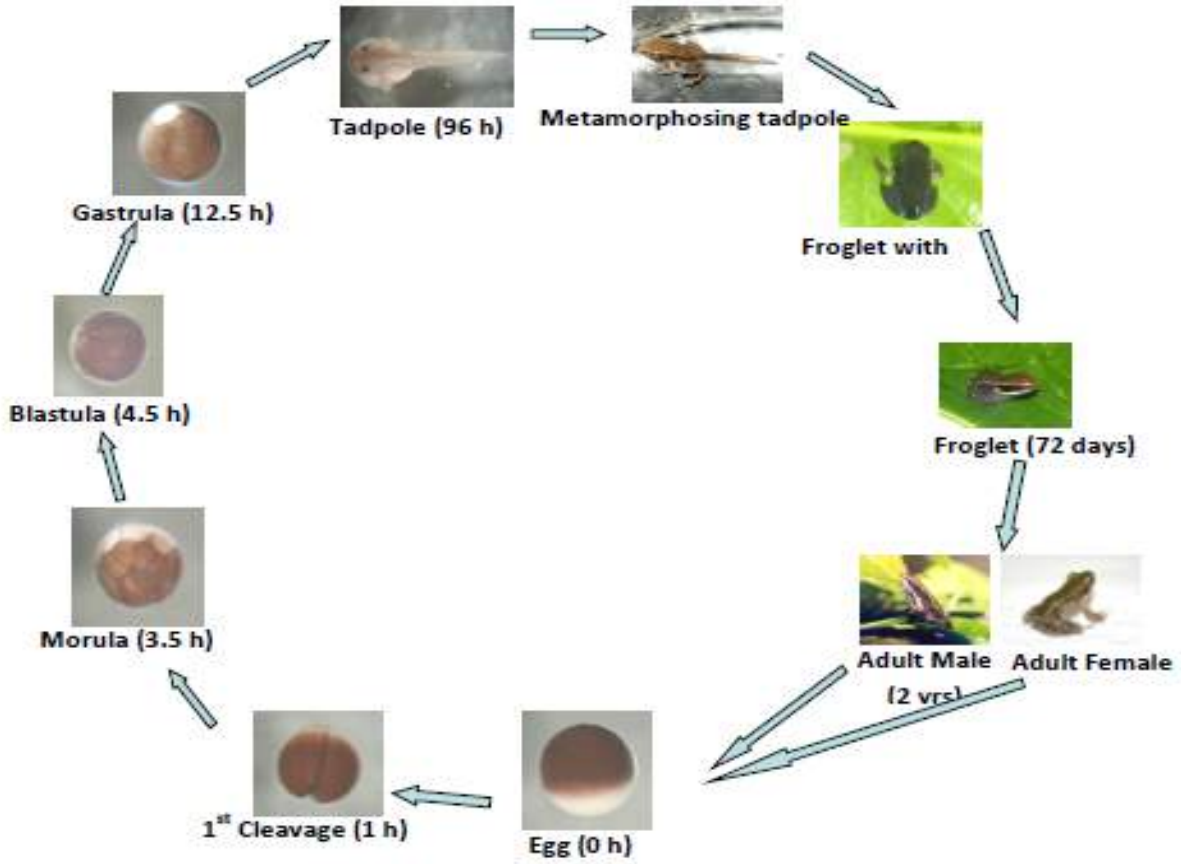


Variation of tiller number of rice seedlings within the rice growing season.

Research concept



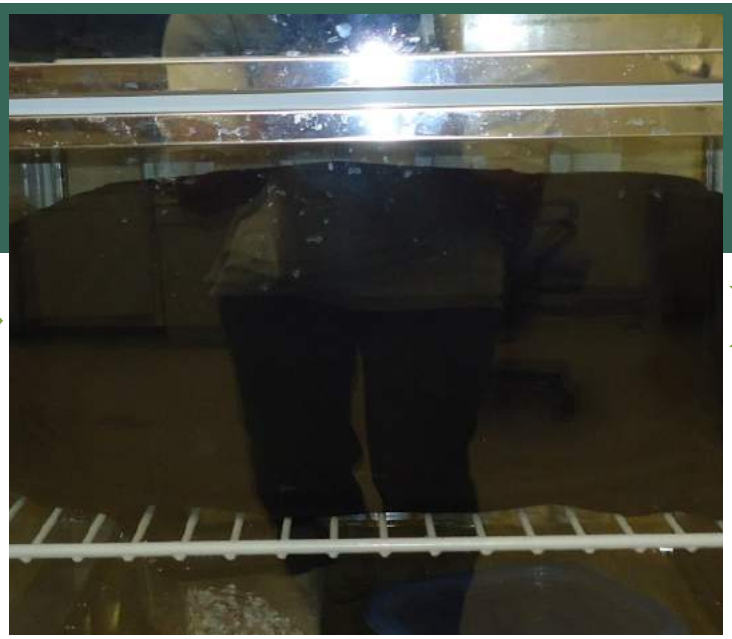
FROGS METAMORPHOSIS



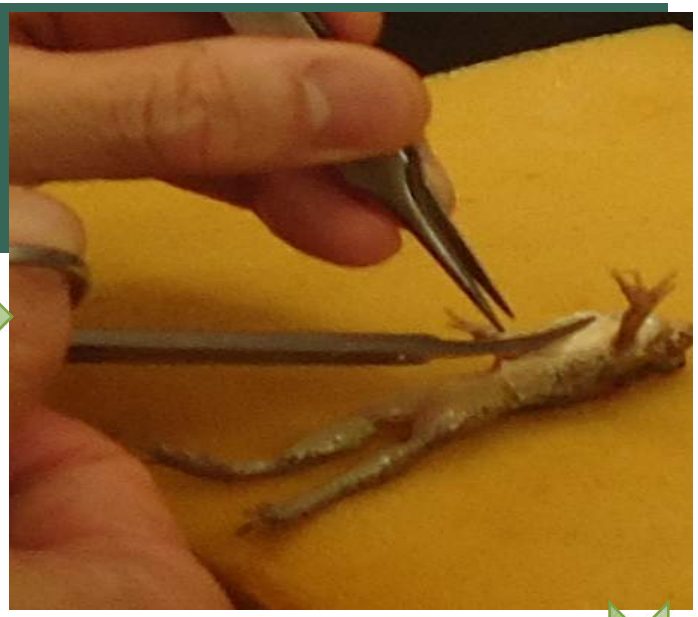
R.leptoglossa

Frogs artificial reproduction methods

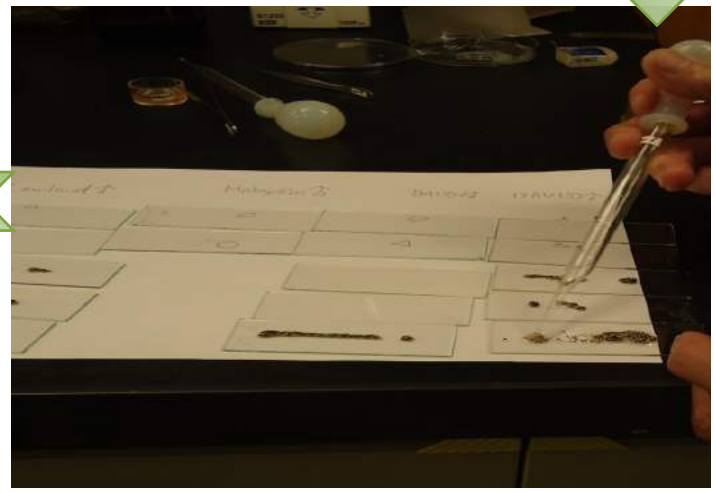
Hormone injecting



Keep the frog inside dark room

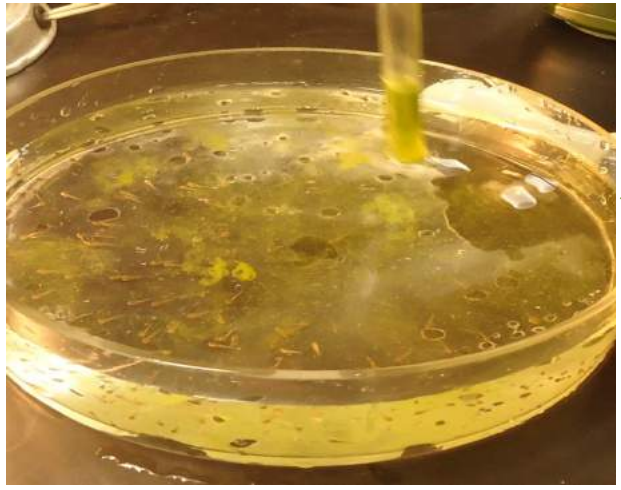


Sperm collection



Insemination

Incubation



Giving food of hatchling frog

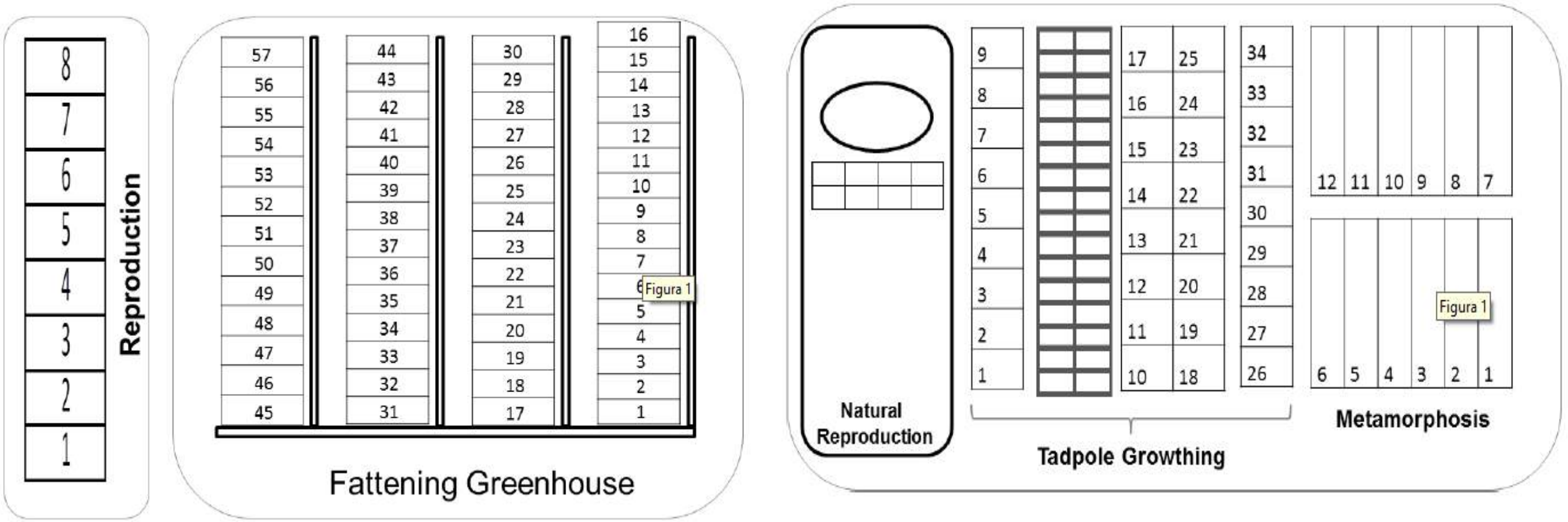
TADPOLES RANCHING

Gosner stage 42 days

Small aquarium

Release subadult frogs

Floor plan illustrating the installations to ranching frogs



Floor plan illustrating the installations of the greenhouses (tadpole greenhouse and fattening greenhouse) of the commercial frog pond in Brazil

ENVIRONMENT MONITORING

- To prevent the possible poisonous effects of agro-chemicals on frog growth, no any herbicides, pesticides, and chemical fertilizers were applied within the rice growing seasons
- Measure of abiotic factor peridiodically.

Challenging of frog farmings in Indonesia

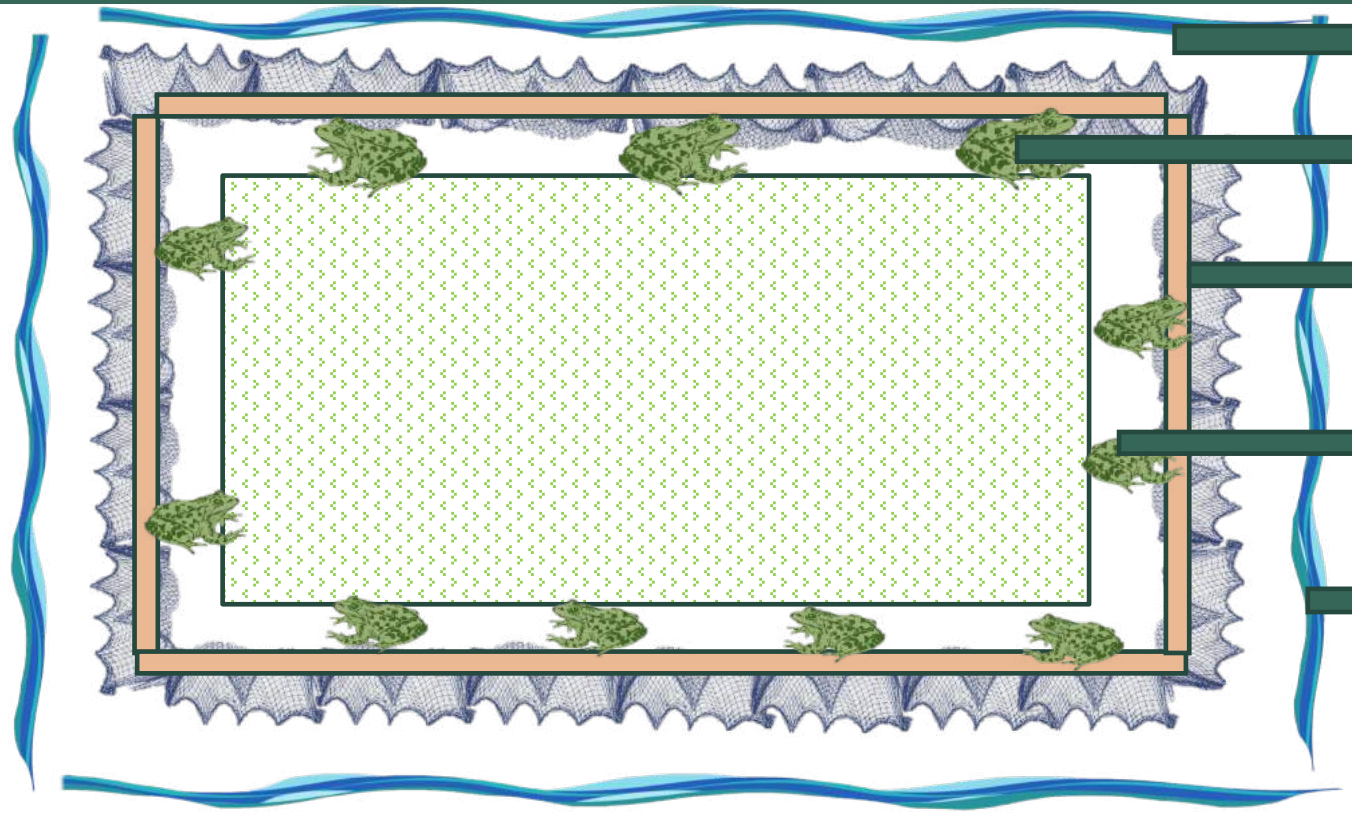
PROBLEMS

- Decreasing frogs population caused by exploitation as food
- Increasing demand market of frogs' legs
- The decline in amphibians leads to an increase in mosquito population
- Lack of knowledge about integrated fish / frog rice farming

MINA PADDY SYSTEM/ INTEGRATED FISH FARMING

- Mina paddy system is one method to increase the production of agricultural crops by raising fish in the rice fields when growing season.
- The system can increase soil quality and reduce pest diseases in rice plants
- In several parts of Indonesia, Mina paddy was used by farmers community

Modifications integrated rice-frog farming model in Indonesia



Fish net

Paddy fields

Rice fields dikes

Space for ranching frogs

Irrigation channels

IMPORTANT THINGS FACTOR OF FROGS FARMING

- Artificial Feeding. Feeding is the critical process in culturing frogs successfully. Poorly fed frogs are susceptible to disease and frequently resort to cannibalism
- Pond Design. Ponds should be deep enough to protect the adult frogs and tadpoles from extremely hot or cold temperatures
- Water Quality and Quantity. An abundant supply of high quality water must be readily available to the frogs throughout the growing season
- Diseases The most common disease of frogs, red-leg disease, is due to a bacterial infection (*Aeromonas*), often resulting from overcrowded conditions

(Helfrich et al., 2009)

FUTURE PERSPECTIVE OF FROGS FARMINGS IN INDONESIA

- Paddy fields in Indonesia are 8,087,393 ha (BPS, 2020). Its potential for the development of sustainable agricultural models
- Frog breeding is a relatively recent alternative for an agro industrial
- Reduced harvest from the wild
- New conservation strategy on highly exploited frogs
- Increase the frog population that plays an important role to against rice plant pests
- Increase income of farmers community

Thank You