BALINESE AGRICULTURE IN A CHANGING WORLD

I D.P. Sutjana
Dept.of Physiology School of Medicine Udayana University
Denpasar, Bali, Indonesia

Introduction

Agriculture has been and continues to be one of the economic foundations of Bali and to be a major livelihood for Balinese people. The wide of agricultural area or rice field to be a symbol of community prosperity. It is accepted that in the region which consists of wide of rice fields is considered as a rich region and their inhabitants consequently have a better standard of living, due to having enough food. Because the agricultural sector capable to enhance the community prosperity the people should give effort to own more rice field (build or bought).

All of agricultural activities influenced the daily community activity and become community cultural as well as organization, work tool, household tool, value system, plant which are cultivated, ceremony etc. always related to the agriculture.

Agricultural technology (machine or method) used by the Balinese farmers still simple and inherited from generation to generation. It seems to be no development or progress resulted in that.

1. Organization

Agricultural activity need high energy expenditure and long working hours. It is very fatiguing if the farmers work alone, so that the farmers work together with mutual aid in form of organization. Many forms of organization at farmers level are:

- Subak. The head of subak is called *Pekaseh* and assistant with *pengliman and kesioman* (BSD Project, 1991). He was elected by subak members and usually male. Subak organization is responsible to getting / take care water resources, build dam, water tunnel and canal, management of irrigation, cultivation pattern, choice of seed, pest control, ceremony, sanctions and penalties at the region etc.(Adiputra, et.al. 1995). The *pekaseh* meets the

counterparts from other subaks to discuss problems with water resources, seeding or pest control etc. Subak system has a good agricultural technology in Bali and successful for a long time in manage of irrigation, cultivation pattern from beginning to end of the river and to fulfill rice consumption. The rice field found irrigation the same cultivate session so that the cultivation of rice in some time (Figure 1).

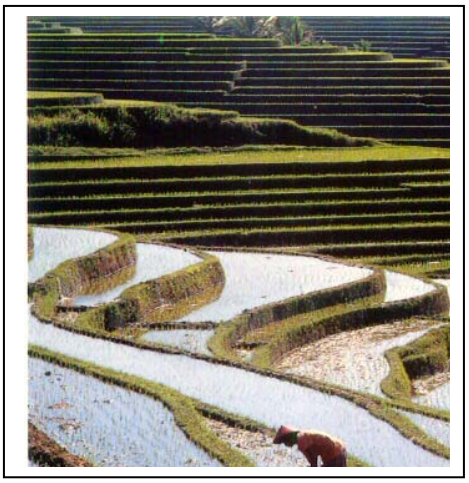


Figure 1 Land preparation of terrace rice field

- Small task organization such as, hoeing organization, cultivating, harvesting, transportation, etc. Post harvesting work such as husking paddy is done together (Figure 2)

With mutual aid the workload become more light and cheaper.

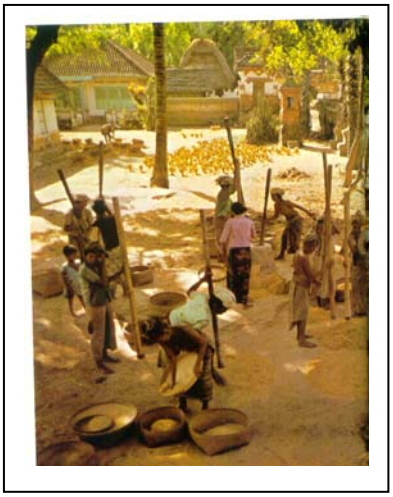


Figure 2 Women are husking paddy

(copy from insight guides 1997)

2. Tool or equipment

The equipment or tools had been use in agriculture are inherited varied from simple to a modified one according to the local condition. The modification of agricultural and household equipment usually do by trial and error. That equipment made by the local blacksmith with participation of the farmers for improvement to be fitted to the user. Many kind of tools or equipment used in agricultural sector are hammer, plough, hoe, sickle, knife, hat, reaping-hook, tool for under ground tunnel, etc. (Figure 3) produced locally and some had already improved using participation approach.(O'Neill, 1995; Sutjana, 1998; Sutjana, 1999)

Due to Programme of extencification and intensification in agriculture it is needed more qualified equipment, such as hand tractor (Figure 4), thrasher, sprayer and grass cutter machine.(FAO, 1994; Suparyono and Setyono, 1994).

a. b

Figure 3 Tool for land preparation. a, tool for under ground tunnel, b. plough

3. Value system

Every region in Bali has it's owned value systems. These value systems close related to the local culture. Many of them are:

- Rice as major food. Some one who consume pure rice, they are the richer or the have, it means they have enough rice for yearly family need. Some people withought eat rice altought they had eat the other food but their feel never eat yet.
- Wide of rice field. Because enough food as a standard of better living or community prosperity) so who are owned wide rice field or big and full rice

barn, the are the richer and owned enough food. So that at that time all people effort to have more rice field as a status of the have people.

- Buying rice are bad status. In many regions buying of rice are taboo because who are buy rice are sown the poverty. It mean they done have enough rice for their family.

4. Crops

In regarding to the value system the crops cultivated are mostly paddy. This is as an effort to fulfil the need of family food i.e. rice. Rice is staple food for all Balinese people, so that to produced paddy are the main effort of the people. During paddy cultivation session, the farmers does not cultivate other crops, although from the prices point of view the income from other crops are higher than paddy. Many kind of paddy cultivate are local paddy, new variety such as IR 70, IR 36, IR 64, Kapuas, Cesadane, etc. The changes kind of paddy cultivated there are changes to the harvesting method and equipment. The local paddy harvesting with standing posture using "*ketam*" (Figure 4 a) and the new varieties with banding posture using sickle (Figure 4 b)

a. b

Figure 4 Harvesting posture. a. local paddy, b. new variety

5. Ceremony

With the background of Hinduism (Balinese culture) many ceremony had been done in connected to agricultural activities as well as:

- *magpag yeh*, praying for enough water during cultivated crops

- *biukungkung*, praying for good production (blooming the paddy flowers)
- ceremony before harvesting
- ceremony for pest control, etc.

Development of agricultural sector in Bali during 30 year later

The goal for agriculture in Bali is to attain modern, efficient and well-established sector through diversification, intensification, extensification and rehabilitation (BSD project, 1992). The priority of development in agricultural sector still slow. Development of agricultural technology as well as agricultural equipment or tool and agricultural method still on going process. Many years ago very popular with Programme of *BIMAS*, INMAS, *INSUS, SUPRAINSUS*, which are proudness, because Indonesia become self sufficient rice country from big imported countries. But that self rice production only a while, because at that time land preparation like enforcement with agro-chemicals (fertilizer and pesticides) overdose and changes of cultivation pattern from twice a year to triple a year. Obviously increase on rice production but rice production cost increase too. Income of the farmers very low and some time minus, because lost of harvesting. At the last only debt of Bank as left. The benefit getting only by fertilizer and pesticide factory and the farmers still the poverty. The increased use of agro-chemicals (pesticide or insecticides) in particular seems to have been largely uncontrolled and considerable damage has been inflicted on environment and human health as a result. Some study on Balinese farmers were found pesticide poisoning, and increased of pesticide residues in soil and water (BSD project, 1992). There is a double effect on health and environment firstly the exposure of farmers and agricultural workers while spraying (Figure 5) and secondly the introduction of unwanted chemicals into the food chain (O'Neill, 1995). But better information and training not yet introduced before used that new method to the farmers.

Changes of cultivation pattern from twice to triple yearly associated with overdose of agro-chemicals resulted decreased of land fertility and continued of pest cycle, so the neck session the crops should be need more fertilizer and outbreak of the brown planthopper. As a result many region does not productive anymore and many region had lost of it production.

Development of agricultural machinery (tool or equipment) had been done especially to hand tractor, sprayer, thresher and few of agricultural method as well as *caplak* system, use of new variety of paddy, *tanpa olah tanah* (without land preparation system) using of herbicide: polaris, ronstar etc. (Utomo and Nazaruddin, 1996). Development of agricultural machinery usually supply driven not demand driven so that some agricultural machinery such as mini tractor not fitted to the user (farmers), and the price of that machinery still expensive for the farmers, because during design not consider the farmers demand. Introduced of that machinery some time only for getting more commission, neither to solve the rice field problems, because that tools not yet meet to the farmers need. The new method or programme had been done only break out high production cost, so that farmers income getting low and some time minus. From that condition impossible the farmer should be able to get the better livelihood, moreover to pay children education cost. As a result more of farmers changes of their profession to other sector and sell their rice field, so the rice field change of function to industry, trade, house, hotel etc. It is due to as a farmer not yet enable to get prosperity assurance, so less of young generation attractive to agriculture, and the agricultural education institute does not able to produce educated farmers.

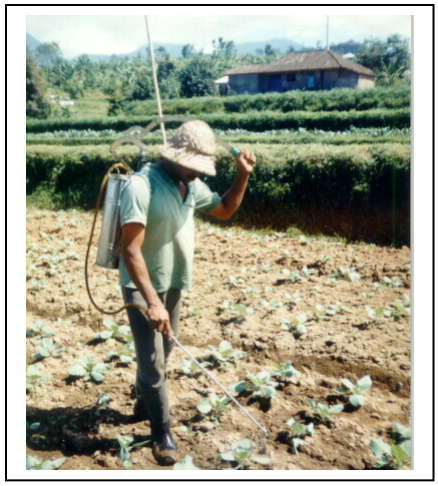
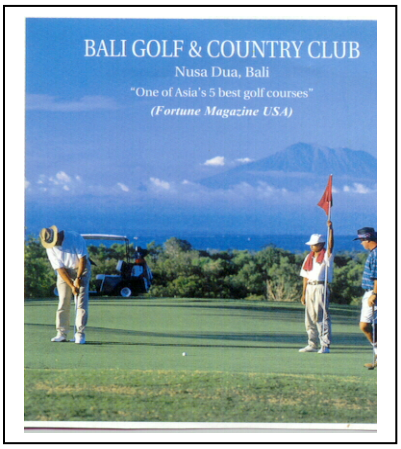


Figure 5 Spraying of pesticide

Many problems for sustainable agriculture in Bali such as: 1. Loss of agricultural land, primarily due to conversion of rice field and dry land to urban expansion and other types of infra structure development including for tourism (hotels and restorant), industry, housing or reseattlement, etc. 2. Loss water has been available for agriculture

because it is used for other purposes such as drinking water as well as for industry, household (Figure 6). 3. Renders the subak ineffective and the sessions implication for the maintenance of the subak system and rice field in other rapid urbanizing areas in Bali. 4 The use of agro-chemicals may not only affect the functions of agroecosystems, but improper use of agro-chemical may be a potential threat to the health of farmers and the customer. Bali in particular, development of agricultural knowledge and technology far behind however the land fertile, all crop can grow up the whole years. Development of agricultural had given lower priority compared with other sector. The programme of agricultural development only for marketable of fertilizer and pesticide without pay attention to the field condition, and all of that produce high production cost. The development policy does not consider how to achieve self sufficiency in a sustainable manner. It does not consider the possibility that some food

a. Rice field with shortage water



b. Golf field with lot of water

Figure 6. Competition of water use for rice field and gold field

crops already may be at their optimal level production, and that to increase production further may result in damage to the environment and human health (BSD Project, 1992).

Globalization decade

In globalization decade where there is practically no border between countries, development of information and transportation technology should be more sophisticated, with consequence the distant become nearest. Agricultural products from other countries

which owned sophisticated agricultural technology (getting abundant with high quality) enter the local market in Bali. Implementation of AFTA by the year 2003 the agricultural production of the other countries may be dominated the local market.

Agriculture has been and continues to be one of the economic foundation of Bali. The majority of the population earn its livelihood from agriculture and the province is an important sources of food products (BSD Project, 1992).

In the future, the development of agriculture must be given high priority because agriculture still to be a major livelihood for most of the community. The development of agriculture ensure to improve the community livelihood. There are very few countries with sophisticated national infra-structure, high levels of personal income and quality of life that have achieved these level without first establishing a strong agricultural foundation (O'Neill, 1995).

Quick changes of information technology and development of agricultural knowledge and technology, must be followed by development of Indonesia or Balinese agriculture. The Institute of Agricultural Engineering should be established the conception, design and development of more needs-related, customer-oriented agricultural machinery and processes; development projects based on genuine rural needs and demands (FAO, 1994). It is appropriate to development of simple low cost but robust, effective, eficient machinery and process, preserved environment, save energy, but must be fitted to the local condition (holistic approach). A system approach mechanization planing should be taken by BAPPEDA, fully involving privat sector, universities, expertise (BSD Project, 1992). The Government must be given high priority for development of agricultural technology, not only to provide the agricultural sector destroyed by other sector. How rebellious we are, because we had destroyed the rice field which are built with drudgery by our ancestors. If the agricultural sector does not developed with a good knowledge and appropriate technology we assumed that the food resource getting worse. So that before we loss all of them the use of agro-chemicals must be reduced. Increased application of other approaches especially inter-cropping, crop varieties, and change to the organic method. Please stop to destroyed the rice field.

References

Adiputra, N; Sutjana, D.P.; Widana, K; Kerana, T; Suyasning; Manuaba, A. 1995. Introducing Ergonomics Through “Subak” Organization Among the Farmers in Bali.

Bali Sustainable Development Project. 1991. A Report on the village of Yeh Kuning Bali Indonesia. Research Paper 11. March. ISBN 1-55014-120-1

Bali Sustainable Development Project. 1992. Sustainable Development for Bali. Research Paper 40. November. ISBN 1-55014-190-2

FAO, 1994. Technical Report Agricultural Mechanization Policy and Strategy Formulation. Volume 1: executive summery.December. Rome, Italy

O’Neill, D.H. 1996. Handtools For Crop Production-Progress Monitoring Visit to Indonesia.

O’Neill, D.H. 1995. Ergonomics and Agricultural Development.

Utomo,M. and Nazaruddin 1996. Bertanam Padi Sawah Tanpa Olah Tanah.PT. Penebar Swadaya. Jakarta.

Suparyono; Setyono, A. 1994. Padi.PT.Penebar Swadaya Jakarta.

Sutjana,D.P. 1997. Improving of Sickle Quality Through Participatory Ergonomic Approach at Batunya Village Tabanan regency. J.Occup.Health. 1999; 41:131-135.

Sutjana, D.P. 1998. Increasing of Farmers Productivity Using Serrated Sickles. Global Ergonomics.