Accepted version published in Human Ecology, 2010

Changing Realities – Perspectives on Balinese Rice Cultivation

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Key words: rice cultivation, agrarian change, household labor, *subak*, off-farm work.

Abstract

This paper discusses issues of agrarian change in south-central Bali. The proximity to urban areas, especially the tourist centers along the southern coast, provides many off-farm employment opportunities for small-scale farming households. Although rice farming continues, for many households it has become a side business. The flexible nature of rice farming in terms of labor input and available casual off-farm work allows farming households to allocate their available labor to a variety of on-farm and off-farm income generating activities. The *subak* which unites farmers in the irrigation and cultivation of the rice crop plays an important role in supporting this flexibility. Still, the future of rice farming and the organization behind looks rather dim with an unwilling younger generation to work in the "mud" and little appreciation of the many benefits the *subak* provides not only to the farming but to the wider community.

Introduction

This paper focuses on the impact of agrarian change on on-farm and off-farm[1] labor patterns of rice farming households in south-central Bali. Agrarian change in Southeast Asia began at the time of the Green Revolution as a process of transition which lastingly altered

[1] By on-farm work we mean work in relation to attending farm animals, the cultivation of sharecropped and owned rice fields including work for the *subak* as well as ritual and ceremonial activities pertaining to and integral to all of these tasks. Work for the *subak* comprises attendance at meetings, preparations and attendance of ceremonies as well as operation and maintenance work on irrigation infrastructure. Off-farm work relates to any other work—community based and household income generating—that does not derive from means on the farm.

former exclusively agrarian societies and economies. Agriculture has become less important as other industries developed. The emergence of non-agricultural industries and rapid urbanization opened new pathways for Southeast Asian farming communities to diversify their livelihoods. Simultaneously, with the introduction of Green Revolution technology packages in the late 1960s agricultural systems were modernized. As a consequence agricultural systems have become more productive and farming communities generally better off as they now participate in a wider, richer and more powerful economy (Harriss 1982: 16-7, 37; Elson, 1997: 238).

In Bali, too, agrarian change and agricultural modernization have had their lasting impacts on the farming community. With the introduction of high yielding varieties, chemical fertilizers and improved labor-saving technologies such as rice mills, handheld tractors and commercial forms of harvesting Balinese irrigated rice cultivation considerably changed. Communal labor-sharing arrangements paid in-kind to meet peak labor demands were replaced by paid labor groups. Balinese farmers intensified rice cultivation from two to five crops of rice in a two-year period with yields continuously on the rise.[2] Both land and labor productivity substantially increased which freed up time for farm laborers to work off-farm.

At about the same time as the Green Revolution packages arrived, systematic promotion of Bali as a mass tourism destination began.[3] Tourism developed rapidly, from 5,000 foreign visitors arriving at Bali's international airport *per year* in 1968 to more than 5,000 tourists *per day* 40 years later (Wall 1996; BPS Bali 2010a). Given the ever-increasing stream of tourists, the Balinese economy prospered and new off-farm employment opportunities directly and indirectly related to tourism arose.[4]

[2] Bali presently harvests 5.8 tons of rice per hectare, which is above the national average of 5 tons per hectare (BPS Indonesia 2010).

[3] In the early 1970s the Indonesian government implemented a first Master plan for tourism development in Bali which included, for example, the construction of major resorts in the island's south and road network extensions (Picard, 1996).

[4] Employment indirectly related to tourism is in those industries which produce goods used in the tourist industry, such as the building or textile industries.

With time freed up and off-farm employment opportunities available, contemporary farming is less important within the total farming household economy. Agriculture as source of employment becomes only one of many options (OECD, 2001; Barker and Molle, 2004). In Bali, there is a clear shift of the labor force from agriculture to non-agricultural industries: while the agricultural labor force decreased from 61% in 1976 to 36% in 2008, the trade industry, which includes part of the tourism industry, increased its labor share from 12% in 1976 to 24% in 2008 (Bendesa and Sukarsa 1980; BPS Bali, 2010b).[5]

Similar shifts have been noted in other Southeast Asian regions. Hayami and Kikuchi (2000: 234-35), for example, show that in a rice farming village in the Philippines household income from farming declined from 90% to 36% from 1974 to 1996, while the share of off-farm income rose from 13% to 64%. Foster and Rosenzweig (2004: 517-18) show that between 1971 and 1999 the share of off-farm income of Indian farming households rose from 19% to 48%. Molle *et al*. (2001) note the trend in Thailand to occupational diversity with 57% of farming households having multiple occupations.

The diversification of the rural household workforce has entailed a number of demographic changes. Skeldon (1999), for example, notes the trend to an aging rural community and the resulting future problem of insufficient farm labor. Barker and Molle (2004) and Rigg (1998) discuss the high inter-sector labor mobility and migration out of agriculture as farmers are responding to new employment opportunities. These developments can also be observed in Bali. Better off-farm working conditions—such as regular working hours and fixed monthly wages—as well as the stigma of remaining a "dirty, uneducated farmer" cause Balinese, particularly the younger generation, to move away from agriculture leaving an aging farming community.

Although many move away from agriculture, the persistence of part-time farming households earning a living from both on-farm and off-farm activities is becoming one of the

[5] The trade industry includes wholesale and retail trade, hotels and restaurants.

emergent trajectories of agrarian change in Southeast Asia (Rigg, 1998; Eder, 1999; Rigg, 2003; Francks, 2005). Part-time farming is possible because peak demands for agricultural labor are short-term and seasonal.

A general pattern in Bali is that the younger, better educated generation pursues regular off-farm work, while the older generation combines on-farm activities with casual off-farm work. A study undertaken in West Java observed similar work arrangements where 73 out of 82 villagers engaged in casual work while nine worked in permanent off-farm positions (Breman and Wiradi, 2002). Although there is a risk with casual off-farm work of perpetuating a farming household's low economic status, it nevertheless allows for the necessary flexibility to shift household labor in and out of agriculture according to peak labor demands. Given sufficient off-farm work, this flexibility in household labor allocation provides for a more regular income which is less dependent on agricultural seasons.

Amidst this transformation of the agricultural workforce questions arise about how contemporary rural households organize labor in the cultivation and irrigation of rice and whether there are any implications for farmer irrigation organizations. As Rigg (2003: 281) points out loss of household members to non-farm work and how this affects agricultural production are key issues of agrarian change. We here follow up Rigg's observations and examine farming households' strategies on an island which is known around the world as a tourist paradise featuring beautifully landscaped rice terraces.

There are two major components that are crucial to understanding contemporary rice farming in Bali: (1) the farming household as the main productive unit and (2) the Balinese irrigation society called *subak* which guarantees the delivery of water to the fields and provides the cooperative and institutional framework for farming households to maintain the collectively-owned irrigation infrastructure. Every household that cultivates rice is a member of the *subak* in which their field is located. *Subaks* are considered to be one of the most

effective hydraulic organizations in the world (Geertz 1972, 1980; Sutawan *et al*. 1990; Lansing 1991, 2006; Ostrom, 1992).

We argue that Balinese farming households show an incredible flexibility in allocating their household labor to diverse income generating activities on and off-farm. Work relating to rice cultivation only peaks at certain times of the season and is accommodated with household and outsourced labor depending on availability of intra-household labor and type of work. Labor requirements towards the *subak* tend to be minimal and thus are managed with household labor. By balancing and shifting on-farm labor requirements between household members, rice farmers are able to embrace agrarian change without abandoning irrigated agriculture. In doing so, they keep the *subak* institutional framework alive. The *subak* offers the adaptable structure which is necessary to fit the different needs of its members.

We examine these issues through the use of a case study of six *subaks* with a membership base of 1700 farming households in a densely populated semi-rural region of south-central Bali. The heavily urbanized areas of Denpasar, the capital city, and the rapidly developing tourist center extending from Kuta along the coast to the north are 45 minutes drive away by motorbike. The 1700 farming households and members of the six *subaks* — who represent approximately a quarter of the inhabitants in the surrounding villages— are engaged in a number of on-farm and off-farm activities.

Our data were gathered during 18 months of field research in the study area, between July 2004 and December 2005, using participant observation, semi-structured interviews with public servants and *subak* heads, surveys with farmers and *subak* heads, detailed time-use surveys of three farming households, and focus group discussions with farmers.

During this period, we lived in one of the nearby villages and participated in local village life. We also sharecropped a rice field of 0.2 hectares for two cultivation seasons with

the help of local farming households and engaged in the communal activities required by the *subak.*

Contemporary rice cultivation in south-central Bali

The area devoted to irrigated rice fields in Bali today is around 82,000 hectares, which is approximately a quarter of the total agricultural land (BPS Bali 2010c). The six *subaks* of interest are located at the southern tip of the rice bowl where the highest rice yields of Bali are achieved. The rice fields within the boundaries of the six *subaks,* a total area of 750 hectares, are cultivated by 1700 farming households with obligatory membership. Each *subak* is subdivided into several sub-units called *munduks* with an average size of 15 hectares for organizational and maintenance purposes. Each *munduk* consists of around 35 members who each cultivate on average 0.44 hectares of land. The majority of the farming households are owners (58 %) who cultivate a single field in one of the six *subaks*. The remaining households are either tenants (28 %) or owner-tenants (14 %), who cultivate on average larger areas of land and often across several *munduks* or *subaks*.

Each *subak* maintains and operates their irrigation network almost independently.[6] The fields are irrigated by a single dam which conveys water from a nearby river into a series of hierarchically bifurcating canals to each *subak* and *munduk.* The general irrigation structure, built upon simple principles such as fixed permanent weirs, requires minimal operational and maintenance input (Horst 1996). Communal labor duties only include operation and renovation works on canals and weirs on the *subak* and *munduk* level. Irrigation work on the

[6] As part of the Green Revolution large infrastructural improvement work was undertaken (Bali Irrigation Project), especially in lowland areas, which merged several subaks to share a single dam. With the new arrangements in place shared structures which include the dam at the river, the main canal and a diversion weir to the different subaks, are now maintained and operated by the public works department. (For more details on the consequences of these changes see Lorenzen and Lorenzen 2005).

field level is undertaken by faming households individually when necessary.[7] Members are also obliged to partake in religious activities and regular meetings in which, amongst other items, planting schedules are determined.[8] Communal labor commitments in the *subaks* of the study area are limited to an average of two days per cultivation cycle which is divided among male or female heads of household, again depending on availability and type of activity required.

The 1700 farming households who cultivate rice in one or several of the six *subaks* live in six surrounding villages with a population of between 600 and 10,000. The farming community in these villages represents approximately 25 % of the total number of households of all the six surrounding villages.

Labor requirements in today's irrigated rice cultivation

Most work on-farm is managed by the farming household. However, at certain stages of the rice cultivation cycle additional labor is required. Before the introduction of new technologies, peak labor requirements during soil preparation, weeding, transplanting and harvesting, were met by the use of hamlet-based communal labor-sharing arrangements. Nowadays, many Balinese farming households resort to outsourcing such work to paid labor depending on their financial capacities and household labor availability (Fig.1).

The cultivation season from soil preparation to harvest is around 19 weeks or between 110 and 115 days, involving 391.5 hours of household labor and 242 hours of outsourced labor, which averages to about three household labor hours and 1.8 outsourced labor hours a day. Labor input peaks in weeks six, eight and eleven, and then again between weeks 16 and 19, with more than 50 hours work required per week (Fig.1). There are low labor input

[7] With fixed permanent structures in place operation and maintenance is minimal as infrastructural modifications are not permitted.

[8] Balinese subaks have become famous for their meticulous planning of planting schedules to reduce pests and share water equally among up- and downstream subaks (Lansing 1991, 2006).

periods during cultivation where hardly any work is required apart from monitoring crop health and water levels.

In terms of allocating farm household labor versus paid labor, the data show that tasks requiring physically-intense labor in peak periods of the cultivation cycle—such as plowing, transplanting, weeding and harvesting—are outsourced to hired wage labor teams.[9] The remaining work which is more flexible and less physically exhausting but often needs more time is carried out by available members of the farming household.

It is notable in contemporary rice cultivation that farmers in the rice fields on a daily basis are usually older household members. The average age of the 178 farmers we interviewed in the fields at different times of the day was 54.5 years. In most cases their children had married (taking over the main responsibility for the household) or were old enough to earn their own living. Many of the older generation stop working off-farm and devote their time entirely to on-farm activities when household finances allow. These on-farm activities also include livestock husbandry for which a considerable amount of time is needed to gather fodder. It is expected, however, that the male head of household and his wife participate in the physically exhausting work in the rice fields even if they engage in off-farm activities. If both, male head of household and his wife spend much time in off-farm employment then the physically more strenuous tasks are outsourced to wage laborers. This seems to be especially the case where off-farm work arrangements are less flexible, as with permanent employment.

Recruiting workers is a very flexible process. There are no strict rights to employment, or for cooperation between kin-related households or friends. Nonetheless, there is an unwritten rule that farmers who need wage laborers for transplanting and weeding should hire female working groups from the same hamlet. Only in times of labor shortage will farmers seek hired hands outside their own hamlet. Usually the women of the hiring household go

[9] Payment is in cash and calculated by day or unit size worked.

around asking their friends or working teams if they are available. Then a day and a price are negotiated. Normally, household members work alongside the recruited additional workers, again depending on household labor availability.

As a general principle, the older generation in the household undertakes the routine work which has to be done every day. This includes monitoring plant health and water level in the field as well as general maintenance of irrigation canals and dykes. This kind of labor is less strenuous, and requires between one and two hours a day. It can be done at any time of the day and is often combined with gathering fodder for the cattle.

The scaring of birds during the rice grain ripening period is an important factor in reducing crop damage and increasing the selling price even though it is the most time-consuming stage of the cultivation cycle (Fig. 1). This work is undertaken by household members and cannot be outsourced because it would cost too much money. Our observations during our own bird scaring activities suggest that younger household members participate in this activity in the morning before they leave for their off-farm work and in the evening after work until sundown. In between, the older household members take over and sometimes teenage children fill in, if necessary.[10]

The major outsourced labor activities are plowing, transplanting, weeding and harvesting. The plowing is done by hired workers who operate a hand-held tractor.[11] The tractor operator works his way through the *subak* from the topmost to the bottom-most field in each *munduk*. Farming household representatives make sure that they are in the field when the

[10] Teenagers are rarely seen working in the rice fields. Parents and children alike see education as the key to good and permanent off-farm employment.

[11] The hiring of the hand-held tractor and its operator is organized through the munduk but paid by each household individually.

tractor arrives to assist with watering.[12] However, working with the tractor has drastically reduced soil preparation time.[13]

Transplanting and weeding have to be done at particular times during the cultivation cycle. Transplanting seedlings requires planning as it has to be done 21-25 days after sowing and on a particular day deemed to be favorable according to the Balinese calendar.[14,15] Weeding is usually done shortly before chemical fertilizer is applied to the crop to prevent weeds from profiting from the applied nitrogen.[16] Depending on the availability of household members, the household employs between one to four additional wage laborers. Harvesting is outsourced to a trader and his harvesting teams, although commonly part of the crop is harvested by the household to cover its own consumption requirements until the next harvest.

Ceremonial preparation and execution of ceremonies, which are regular repetitive tasks, are not outsourced but exclusively organized by adult female household members.

On-farm work is assigned to different household members depending on type of work and availability of off-farm work. While there are many household members (elderly persons and children) who can do minor routine work, there are not as many who can do the physically strenuous work, since they are usually the most involved in off-farm labor. Nevertheless, households that lack elderly persons or children for routine work can still pursue off-farm work during the less labor intensive period during the first 15 weeks of the cultivation cycle (Fig.1). In such a case, casual off-farm work is more likely to be suitable as this kind of work can be arranged more flexibly and adapted to on-farm work needs. In some

[12] The six subaks in the study area stagger their cultivation cycles with a time interval of three weeks to avoid water stress during the plowing phase. For more on rotational cropping, see Lorenzen and Lorenzen (2005).

[13] While a hand-held tractor can plow an average field of 0.5 hectares in half a day, it takes up to two days to do the same work using draught cattle. In addition, cattle need to be trained to do this work and the work itself is physically more strenuous.

[14] The transplanting period, which lasts between one and two weeks, is set by the subak head, who starts transplanting in his field. Subak members then have to transplant their seedlings at some time within this window.

[15] The Balinese calendar system is a complex overlay of several calendars based on solar, lunar and ritual cycles which combined together determine auspicious days for specific activities related to life in general but also to the cultivation of rice and animal husbandry.

[16] Fields are weeded three times during the cultivation period: once shortly before and twice after (around 15 days and around 40 days) transplanting seedlings.

households with no elderly members and the male household head working permanently off-farm, the female household head takes over much of the labor related to rice cultivation. Again, for hard or hazardous work such as hoeing, applying pesticides and harvesting, wives are joined by their husbands on their off days or on holidays.

In summary, farming households adopt different strategies in pursuing on- and off-farm work depending on their skills base and availability of land to cultivate rice and casual or permanent work off-farm, while the *subak* offers the necessary structure to accommodate the different needs of its members.

Labor and the *subak*

It is interesting that because all *subak* members participate in labor-intensive tasks, mainly irrigation infrastructure operation and maintenance, labor requirements for the *subak* are marginal. Each *subak* requires obligatory communal commitments between three to five times a year, which last on average half a day and consist of communal maintenance work, meetings and preparation and attendance of ceremonies.

Communal labor assignments are organized by *munduk* leaders in consultation with the *subak* head and usually fall on a Sunday. All obligatory communal labor requirements are calculated on the basis of how much land a household cultivates, so households with more land contr*ibu*te more than one member to communal assignments. Members not attending communal labor work are fined. There is still, however, a strong stigma attached to repeatedly absenting oneself from communal labor commitments, and with other member households living in the immediate vicinity evasion or work shirking becomes even harder[17], so in general households make sure that they send a representative to these events.

Subak assemblies take place between one to four times a year – again varying from *subak* to *subak* – and play an important role in the administration of contemporary *subaks*.

[17] See also Lorenzen *et al.* (2005).

Meetings are held for two to three hours in the evening. Some *subaks* in the research area organize meetings on the *munduk* level only. These meetings are conducted immediately after communal maintenance work projects.

Ceremonies are held to mark particular stages of the growing rice plant. In the research area farming households commonly perform seven ceremonies for one cultivation cycle. The majority of participants are female household members. Ceremonies on the *subak* level, in which every farming household is obliged to participate, are only performed in the main cultivation season (*kerta masa*) and consist of five ceremonies organized by the *subak* head, plus one on the inter-*subak* level. The *subaks* in the research area use different systems to organize the ceremonies and the preparation of offerings. Some use a rotational system in which a *munduk* is responsible for preparing the ceremonies for one cultivation cycle. In others, the *subak* leader together with the *munduk* leaders and their wives make the preparations. In one *subak*, the leader employed a few women from his hamlet for the preparations so that no labor input from *subak* members was required.

The way the *subak* ceremonies are organized is decided by all *subak* members in a democratic election at the assembly. The conduct of the assembly reveals that *subak* members undertake to reduce their obligatory labor inputs to a minimum without abandoning or weakening the *subak*. They have a strong belief that the ceremonies are of utmost importance for the well-being and proper functioning of the *subak*, but do not think that their personal involvement is necessary for those activities. If the ceremonial preparation is outsourced to paid workers, then preparation costs are born by *subak* funds – naturally this has to be agreed upon at a *subak* meeting.

All in all, members of the six *subaks* which were part of this research spend on average only two days per cultivation cycle in joint labor and other activities. It is therefore not surprising that *subak* obligations are not seen as a burden by members. To the contrary,

they regard communal labor input as a reduction to actual labor requirements for individuals. Such minimal labor input, the older farmers say, was not the case before the dam and the primary canal were reconstructed using concreter. The dam had been built out of palm trees, boulders, sand and dirt and had to be repaired regularly during the rainy season. This was also the case for the shared primary canal which, at some places, regularly eroded due to heavy rainfall. Nowadays with a concrete dam, concrete division structures and lined canals much less communal labor is required.

The *subak*, therefore, impinges minimally on a farming household's labor contr*ibu*tion and only marginally regulates individual terrace labor management. This gives every farming household enough freedom to adjust their agricultural labor to other income-generating activities. In fact, for many farming households, rice cultivation has become a side business. Because rice cultivation is managed by whole households, the work on the terraces is shifted from one household member to another according to off-farm labor commitments of individual members.

The minimal influence of the *subak* on farming household's decision making in terms of rice cultivation and allocation of labor is not necessarily a new phenomenon. What is new is that communal labor arrangements on the terrace level have been replaced by hired and paid workgroups. Thus, irrigation and cultivation of rice have to be seen as quite distinct matters in organizational terms.

An example of household labor allocation to on- and off-farm activities

The Renda household consists of six members:[18] *Pak* (father) Renda is the only son of *Kak* (grandfather) and *Nenek* (grandmother) Renda. He has two sisters who are married and who – as is the custom in Bali – left their natal compound to live in the compounds of their

[18] All names appearing in this text are changed.

husbands. *Pak* Renda and his wife *Ibu* (mother) Renda, 37 and 35 years old, have two children. The daughter, Putu Renda, is 13 years old and attends the local junior high school. The son, Made, is ten years old and goes to the local primary school.

Once all their children were married, *Kak* and *Nenek* Renda gave up their own household and joined the household of their son and his family, who live in the same compound. After they married, *Pak* and *Ibu* Renda became the active representatives of their household in the hamlet and village and share the main responsibilities for all household members and for household income and expenditures. *Kak* and *Nenek* Renda have retired from main household responsibilities and hamlet and village communal obligations, although they still participate in on-farm and residential household labor activities as much as their age permits.[19]

The household cultivates 0.35 hectares of rice terraces in two different *subaks* of which they own 0.15 hectares in one *subak* and sharecrop 0.2 hectares in the other.[20] They usually sell the yield of the sharecropped area and harvest their own fields for household consumption. Because they are located in two different *subaks* the cultivation cycles of the two fields are usually about three to four weeks apart. Although they say that they manage the rice fields together, it is *Kak* Renda who puts in the main labor.

The household is basically engaged in four major categories of activities in their daily life: on-farm and off-farm income and non-income generating activities (Figs 2, 3 and 4).[21]

[19] *Nenek* Renda is marginally involved in on-farm activities because she suffers from serious gout and migraine. Occasionally, she engages in secular and religious household activities to support Ibu Renda and, if her health allows, she joins one of the hamlet-based labor groups for transplanting of weeding.

[20] They cultivate a smaller area compared to the average owner-tenant (0.67ha)

[21] The data for these figures is derived from a detailed time-use survey over a period of five-month complemented with our own observations, experiences cultivating a rice field, and personal communication with the survey participants. We asked participants to individually record their daily activities divided into 30 minute brackets on a daily basis for the previous day. For the analysis we coded the data into seven main categories: on-farm production activities; off-farm production activities; management of household; care of family members; community services and help to other households; social and cultural activities; and personal care and self maintenance. All categories contained several sub-categories, each of which was again subdivided. On-farm production activities, for example, were broken down into seven sub-categories: rice field activities; animal husbandry, dry land activities; processing and storage (for own use); construction, maintenance and operation of farm infrastructure; manufacturing activities; and on-farm religious activities. Each of these sub-categories was

Major on-farm income generating activities are rice cultivation and animal husbandry (two cattle and two pigs). Major on-farm non-income generating activities include communal *subak* work obligations and ritual activities related to agriculture and household-welfare. Off-farm income generating activities include casual or permanent employment off-farm either on other farms or non-agricultural. Off-farm non-income generating activities include communal obligations towards the extended family (kinship group) and towards the hamlet and the village (Table 1). The obligations towards the community are divided according to gender among the household members.

Pak Renda's focus is on off-farm work (Fig. 2). In all but two of the weeks analyzed he devoted between 50% and 80 % of his time to off-farm income and non-income generating activities. Off-farm, he spends most of his time working as a carpenter and joiner at construction sites and in a joiner's workshop. He is also employed on a casual basis by a builder who lives in the same hamlet. He gets paid daily if he works for shorter periods of time (a couple of days), and weekly if he works longer periods (a couple of weeks). When there is less work available in construction, *Pak* Renda helps out in his sister's furniture shop where he assembles the newly-arrived furniture and delivers it to customers.

As the male head of household, he has several commitments towards the extended family, hamlet and village community (Fig.2:'off-farm non income generating'). These commitments include participation in hamlet assemblies, hamlet working groups and village ceremonies. When larger village or hamlet ceremonies take place, he reduces his off-farm labor to fulfill his community obligations (Fig. 2: week three, four, fourteen, and eighteen).

Pak Renda also participates in the cultivation of rice and other on-farm activities (Fig. 2: 'on-farm income generating'). He is, however, only marginally involved in animal husbandry, and gathers fodder for the two cows and two pigs only if his father and his wife

broken down into even more categories, so that the main category (on-farm production activities) actually consisted of 76 different coded activities. Figures 2, 3 and 4 in this paper represent a simplified version of the whole data set.

are otherwise busy. All on-farm activities have to be adjusted according to his community obligations and current available off-farm work. He attends all communal work sessions, which usually fall on a Sunday (Fig. 2: 'on-farm non-income generating') reflecting the *subak*'s adaptability to today's needs of its members who maybe pursuing different types of casual or permanent off-farm work during the week.

A comparison of work share of the three adult household members in the rice field (Fig. 5) shows that his work share (in total 17 %) increases slightly if there is harder work to do as, for example, during soil preparation (32 % of total soil preparation work), transplanting (40 % of total transplanting work) and again when the fields need weeding and application of fertilizer or pesticide (18 % of total crop management work). In times of water shortage, especially in the critical first two weeks after transplanting, he and his father work out a rotational schedule to make sure that water flow is monitored throughout day and night though his work commitment in monitoring water levels is relatively small (8 %).[22] The work he usually does in the rice fields is physically strenuous and needs to be completed in a relatively short time frame.

Pak Renda says that his labor allocation is clearly prioritized. First come obligations towards the extended family and the hamlet, then off-farm employment, and then on-farm activities. He says that the priorities will shift once his children are married. Then he will reduce his off-farm work and increase his on-farm activities. At the moment, he argues, his household is able to sharecrop 0.2 hectares because his father is still healthy. Should *Kak* Renda however reduce his on-farm work in the near future, they will have to reduce their sharecropped area as long as *Pak* Renda has sufficient off-farm work.

Ibu Renda also works in construction. Like many other couples, she and her husband met at a construction site in Kuta, the main tourist centre in Bali. While she used to work

[22] Farmers go out at night and increase water flow into their own fields. This activity is called borrowing water, which is permitted to a certain extent. Stealing of water is not allowed. For more on borrowing, see Lorenzen *et al*. (2005), and Lorenzen (2008).

more off-farm before she had children, now she considers the distance from home before she accepts a job because her priority lies in the management of the household and services to the village and hamlet community. In fact, three quarters of her time is dedicated to the secular and religious welfare of the household and community obligations (Fig. 3: 'on-farm and off-farm non-income generating'). She does almost all the domestic work such as shopping, cooking, washing and cleaning. A considerable amount of her time each day is allocated to the preparation of offerings for ceremonies at household and community level. Within the household, there are small ceremonies performed daily and larger ones on frequently-occurring holy days. She also joins ceremonial preparations at the hamlet and village level where married women are expected to attend and which can take several days. While she prioritizes community and household work, she is also responsible for looking after two pigs which takes up to 20 % of her total time (Fig. 3: 'on-farm income generating').

Her engagement with rice cultivation with a total work share of 11 % is mainly of a ceremonial nature (Fig. 5). With her father in-law she also harvests the rice that is used for household consumption. Her rice field activities increase occasionally if both men are busy with other obligations, when she monitors water flow and plant health. Her rice field activities are reduced to zero when she is busy with communal preparatory work for ceremonies in the hamlet or village.

Kak Renda does not work off-farm but is the key person in relation to daily routine tasks on the rice terraces, where he does 72% of the work (Fig. 5). He monitors water flow, clears the bunds of weeds, monitors the rice crop and does the constant weeding to keep the fast-growing weeds under control. He also applies fertilizer and pesticides if his son is not able to do so. He combines his daily trips to the rice fields with cutting grass along the rice bunds for the cattle (Fig. 4: 'on-farm income generating').

Apart from his work in the rice fields, *Kak* Renda is also a *munduk* head in the *subak* in which the household owns land. This requires him to meet with other *munduk* heads occasionally, supervise *munduk* communal work events, help prepare *subak* ceremonies and, on rare occasions, act as a mediator when there is a conflict between two farmers. Although he tried to resign from this role, *munduk* members wanted him to continue. He therefore has to wait until someone else is willing to take over or his age forces him to retire. He still attends *subak*, hamlet, and extended family ceremonies (Fig. 4: 'off-farm non-income generating'). It is of utmost importance to keep in close contact with the extended family because of shared ancestry. The links between the living and the dead are crucial aspects contr*ibut*ing to the harmonious functioning of the household. Attending village and hamlet religious ceremonies means acknowledging the importance of the village community.[23]

The household's children are only marginally involved in tasks related to irrigated rice cultivation. While Putu Renda has to help her mother with preparing ceremonial offerings, Made is too young to be involved in any activities, although his parents hope that he will help out the household when he is older. Unfortunately, they say, many young Balinese are not willing to join their parents in the fields anymore. Being a rice farmer is not seen as a desirable career path, particularly because the dark tan of many farmers and the "dirt" involved in rice cultivation are symbols of lower status, poverty and little education. His parents hope that Made will be able to find a good job that enables him to support his own future family without having to abandon irrigated agriculture. So basically, they expect Made to engage with both on and off-farm activities, but with higher off-farm income than his father. They don't see a problem of having to abandon rice cultivation due to full-time

[23] Balinese can't live by themselves, says *Kak* Renda. The hamlet community is as important as the extended family, and every household is required to be fully committed to its hamlet. Balinese maintain that hamlet members have to build strong relationships in good times, so that they are strong in times of need. They call this relationship between households and their hamlet *'suka-duka'*— meaning compassion and solidarity.

employment because field size can be adjusted to off-farm employment obligations and income security.

The example of this farming household shows its capabilities of coordination and flexibility in task performance that are characteristic of smallholder households such as emphasized by Netting and others (Netting 1989, 1993; Bray 1994; Eder 999). Our observations of and discussions with other farming households in the research area have shown very similar patterns and flexibility of labor allocations amongst different household members. The only exceptions are ceremonial preparations and household activities, which are almost exclusively done by women. Otherwise, labor obligations are allocated so that the household as a whole benefits.

Off-farm employment obviously plays an important role because financial means are needed to cover daily expenditures. Seasonal income from selling harvested rice, while a considerable contr*ibu*tion to household income, does not suffice and fluctuates for a variety of reasons such as changing market prices as well as unpredictable environmental variations. Nevertheless, rice cultivation is continued because yields cover household rice consumption and provide income, and labor for growing rice can be fitted in with other work, although the extent of land cultivated depends on the total workload of the other occupations that household members are engaged in.

Conclusion

Rice cultivation continues to be an important income generating activity for rural farming households in Bali. It has, however, become just one of several other income-generating household activities. Agricultural modernization has provided the technologies to reduce labor input and reorganize rice farming to become more flexible with peak labor demand accommodated by household or outsourced hired labor. The many tourists arriving in Bali over the last 20 years have created a new market for casual and permanent off-farm

work. In this sense, agrarian change has been beneficial to the farming households. The many off-farm employment opportunities for skilled and unskilled labor, casual or permanent, have given household members a varied set of possibilities in generating sufficient income. Meanwhile farming households have been able to adjust their agricultural activities to fit in off-farm work without abandoning rice cultivation. The developments of the past decades show that farming households are adaptive in that they can adjust to changing circumstances and rearrange internal operations to serve new demands and purposes. The persistence of part-time farming is due not only to the new technologies reducing labor input on-farm but also to the competitive advantage of the flexible organizational structure of the farming household, which allows for a continuation of crop cultivation as a side business alongside the household's participation in several off-farm opportunities.[24]

This ability to be flexible in their working arrangements shows also that the *subak* has minimal impact on the farming household in regard to its rice crop management. The *subak* is merely a supportive framework to allow farmers to manage rice production as smoothly as possible, assuring continuous access to irrigation water, minimizing free-riding through joint responsibilities in management and operation, and guaranteeing the protection of the crop by organizing ceremonies and setting a cultivation schedule. Farming households subscribe to these services by paying a small *subak* membership fee and, more importantly, making obligatory communal labor commitments. This labor input requires minimal time and can be organized within the household by allocating impending work to available members. Nevertheless, the services the *subak* provides to its members are paramount. Communal *subak* work obligations substantially reduce labor requirements of individual households and support Bali's particular methods of rice cultivation, which are seen as foundation of regular high yields: synchronization of irrigation and ceremonies mean less pests (Lansing, 1991);

[24] See for example Eder (1993: 665) who ascribes the persistence of part-time farming to the 'extraordinarily resilient social organizational' nature of the farming household.

joint operation and maintenance of the irrigation system means less work for the individual (Ostrom, 1992); joint water management means group pressure on free-riders (Ostrom, 1990).

The shift from communal to outsourced labor for the peak labor periods in the cultivation cycle has been remarkable. But because the kind of work that has been moved from communal to outsourced work was never organized through the *subak*, the effect on the *subak* as an organization has been minimal. The disappearance of communal work arrangements is also a clear sign of a shift from subsistence-oriented agriculture to a more individualized and market-oriented system. Nevertheless, this move is regarded as positive by both older and younger farming household members because they associate the monetizing of irrigated agriculture with greater access to modern consumer goods. The older generation still remembers much harder work in the rice fields in the past, periods of starvation in between harvests, and the overall higher poverty rate within the villages.

Yet, the future of rice cultivation may be in question since many of the younger generation are unwilling to work "in the mud" anymore. The farming community is ageing, a trend which is not unique to Bali (Skeldon, 1999). Better education and permanent skilled off-farm employment opportunities are good reasons not to return to the farm. This trend away from agriculture can also be seen in how part of the farming household's income is invested in children's education for a future non-agricultural profession. Choices however depend on individual household circumstances, such as land available for sharecropping as well as the skills to pursue off-farm non-agricultural work.

Given Bali's high dependence on tourism, global trends also influence these intra-household decisions. In the wake of the Bali bombings and the global economic crisis, for example, tourist numbers significantly dropped resulting in fewer permanent and casual off-farm work opportunities. Those who had kept their rice fields while working off-farm considered growing rice again, while other families who had opted to sell their fields ended

up with serious financial difficulties (MacRae, 2005). The rice field gained importance as it offered a measure of social security in an insecure world.

For the older generation in rural households rice farming is a viable option if enough land is available. Rice farming is a backdrop and security system that generates a continuous and more or less reliable income and a guaranteed supply of the main staple food. Off-farm employment is available in form of casual work. On-farm labor is flexibly accommodated to household labor depending on their off-farm casual work commitments.

Clearly farming households adopt different strategies depending on the capabilities of individuals and possessed assets. Most importantly, however, the *subak* continues to provide the necessary services to all farming households regardless of what particular strategy has been chosen. Yet, the *subak*'s historically strong ties with other entities of Balinese culture such as the village and the temple congregation are clearly weakening due to the fact that rice cultivation is no longer the major economic activity of most Balinese. And with rice fields continuing to disappear and fewer incentives for the younger generations to engage in agriculture the *subak*, as a form of Balinese social organization and way of cooperation, is endangered.

We should keep in mind, however, that rice terraces are a major selling point in the Balinese tourist industry. If rice terraces are not to disappear, incentives have to be created to keep rice farming a viable business option, regardless of off-farm opportunities. While discussions have been initiated by local as well as international Bali scholars on the multifunctionality of rice cultivation, the recognition of the services alone that *subaks* provide is not enough (see, e.g., Sutawan 2004, Arthawiguna *et al*. 2005, and Groenfeldt 2006). If Bali wants to keep promoting itself as a pristine island with a deep cultural heritage and aesthetic landscape, rice cultivation needs stronger connections to tourism to elevate the farming household's status from a simple cash crop producer to a unit with recognized

expertise in sustainable landscaping and conservation. At the moment, the money which flows into Bali through tourism does not trickle down to farming households as compensation of their services in a way which could attract future generations.

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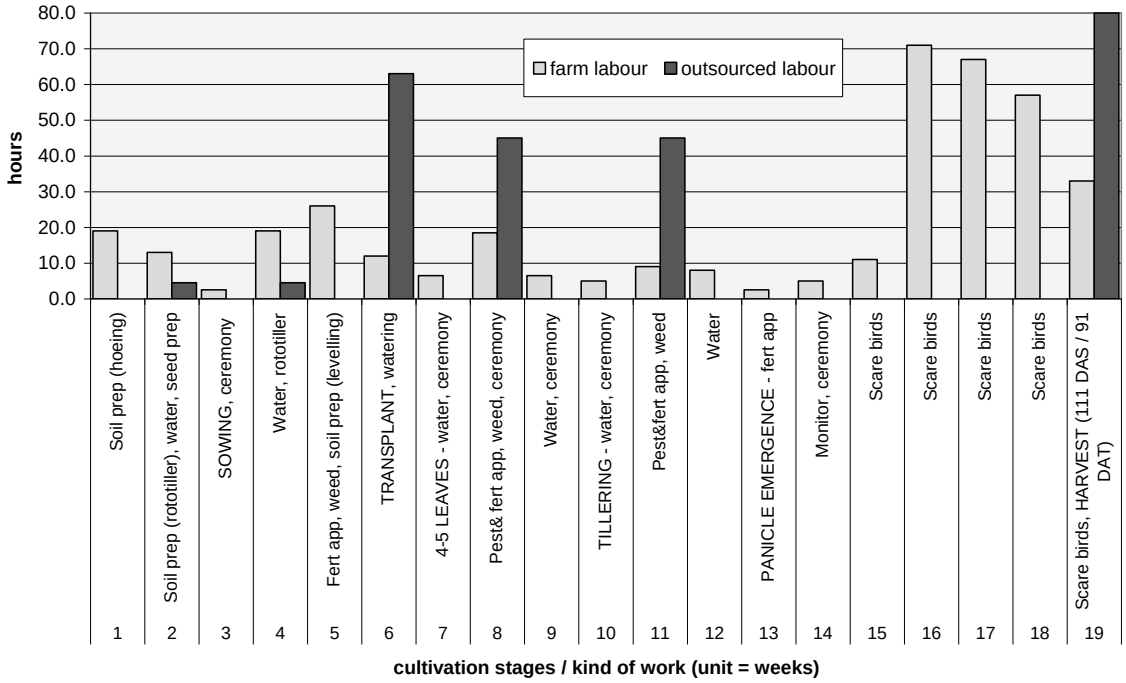
Table and Figures

Table 1 - Major farming household activities

Household activities	On-farm	Off-farm
Income generating	• Rice cultivation • Animal husbandry	Off-farm casual or permanent employment: • Agricultural wage labor • Non-agricultural wage labor
Non-income generating	• Religious and secular household management • *Subak* communal work • Agricultural rituals – preparation and execution	Communal obligations towards: • Extended family • Hamlet • Village temple congregation

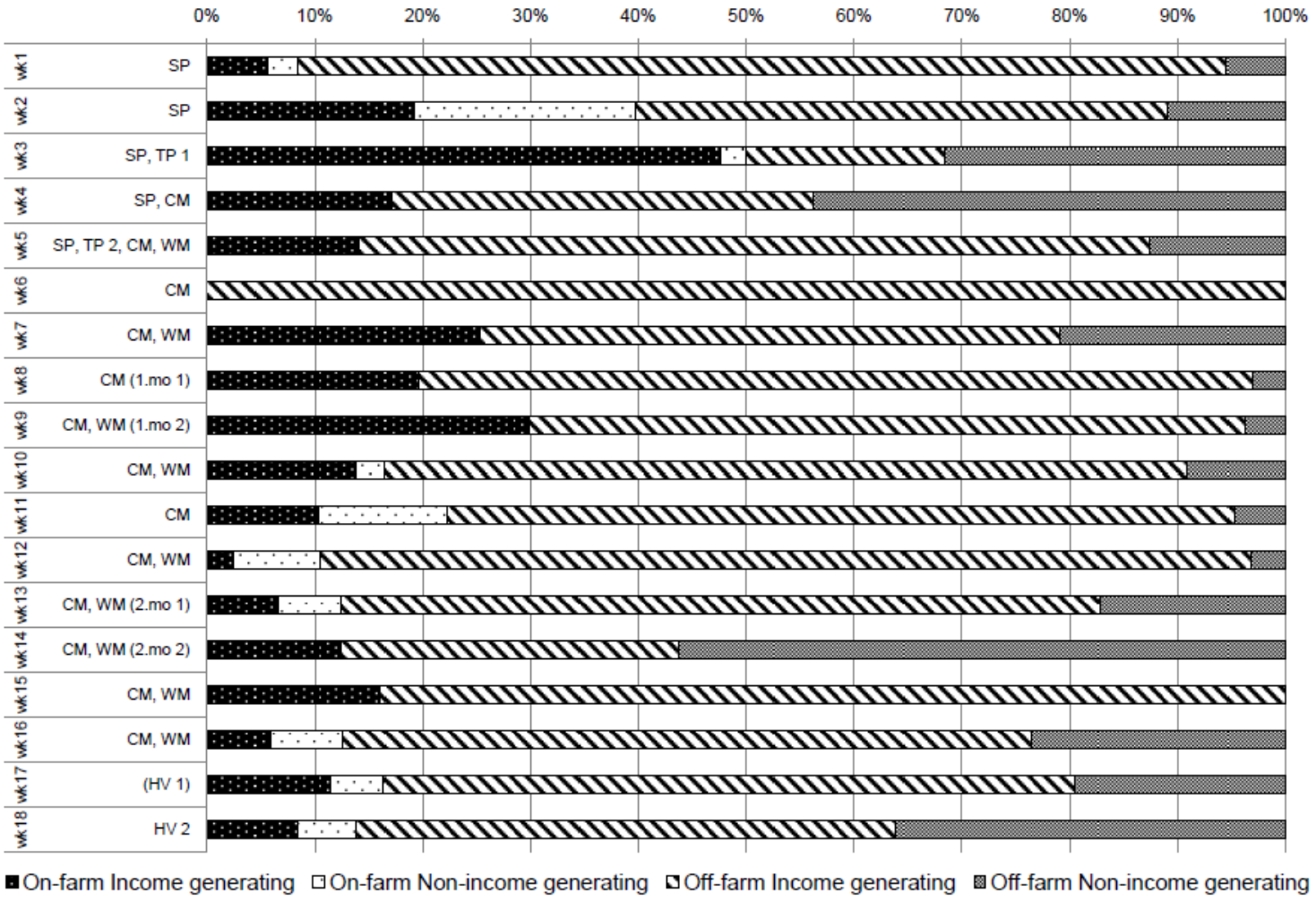
Figure 1 - An example of how a contemporary farming household typically organizes upcoming work for one cultivation season using household and paid labor for an average-sized rice field of 0.47 hectares[25]



Key to figure
4-5 leaves = Growth stage when rice seedlings have developed four to five leaves
Tillering = Rice plants produce additional shoots
Panicle Emergence = The rice flowers/fruits emerge from the shoots, also called heading
DAS = Days After Sowing
DAT = Days After Transplanting

[25] The presented data are drawn and averaged from three different households, from our own cultivation experience, and verified through discussions in the focus groups.

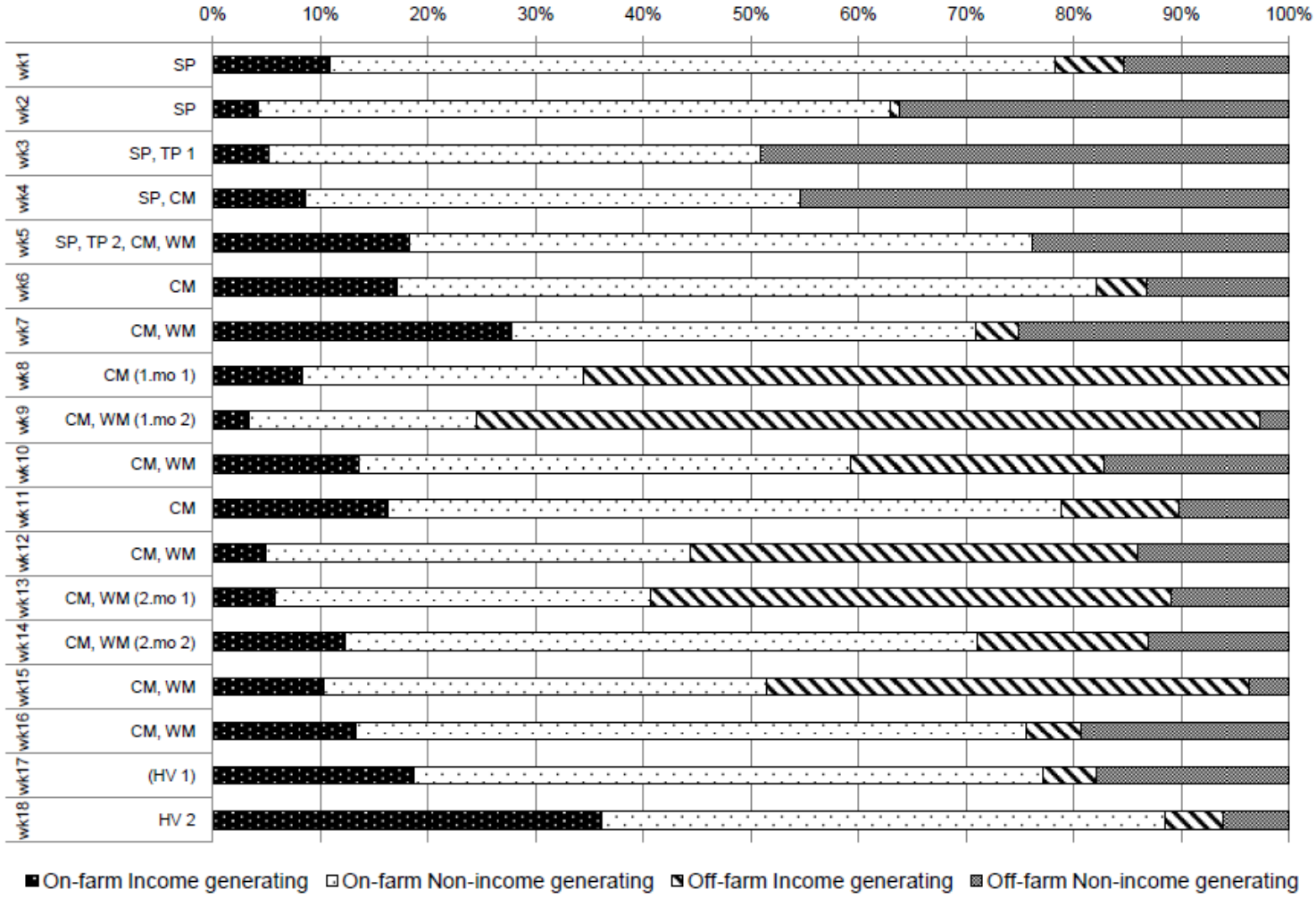
Figure 2 - Labor allocation of male household head (*Pak* Renda) to on- and off-farm income and non-income generating activities



Key to figure

Growth stages	Cultivation activities		
1.mo 1/2 = Rice plants in field 1/2 are one month after transplanting	SP = Soil preparation	WM = irrigation maintenance and operation on field level	HV 1/2 = Harvesting of field 1/2 (note that field 1 was harvested by the trader)
2.mo 1/2 = Rice plants are 2 months in the field after transplanting	TP1/2 = Transplanting of field 1/2	CM = weeding, application of fertilizers and pesticides	

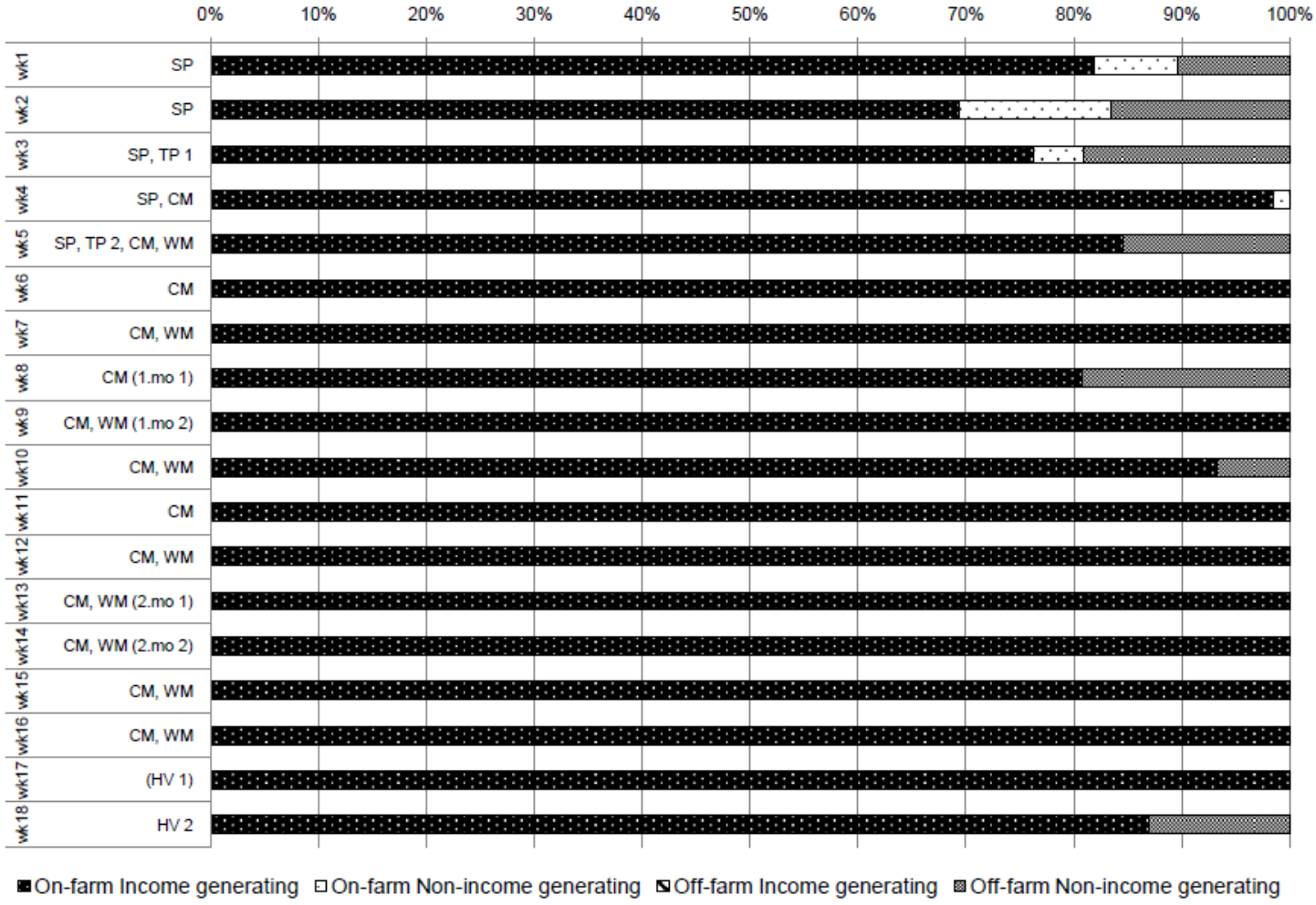
Figure 3: Labor allocation of female household head (*Ibu* Renda) to on-farm and off-farm income and non-income generating activities



Key to figure

Growth stages	Cultivation activities		
1.mo 1/2 = Rice plants in field 1/2 are one month after transplanting	SP = Soil preparation	WM = irrigation maintenance and operation on field level	HV 1/2 = Harvesting of field 1/2 (note that field 1 was harvested by the trader)
2.mo 1/2 = Rice plants are 2 months in the field after transplanting	TP1/2 = Transplanting of field 1/2	CM = weeding, application of fertilizers and pesticides	

Figure 4: Labor allocation of grandfather (*Kak* Renda) to on-farm and off-farm income and non-income generating activities



Key to figure

Growth stages	Cultivation activities		
1.mo 1/2 = Rice plants in field 1/2 are one month after transplanting	SP = Soil preparation	WM = irrigation maintenance and operation on field level	HV 1/2 = Harvesting of field 1/2 (note that field 1 was harvested by the trader)
2.mo 1/2 = Rice plants are 2 months in the field after transplanting	TP1/2 = Transplanting of field 1/2	CM = weeding, application of fertilizers and pesticides	

Figure 5: Labor share of each household member for all activities related to rice cultivation (on-farm rice field and *subak* related work)